SUSTAINING URBAN SYSTEMS AND PEOPLE'S PERCEPTION:
with reference study to Edinburgh and Ottawa.

Thesis Submitted for the Degree of

Doctor of Philosophy

in

Architecture

By

Ali Taileb

Heriott-Watt University
Edinburgh College of Art
Faculty of Environmental Studies
Department of Architecture

2002

Heriot-Watt University
Edinburgh

Abstract of Thesis Form

(Form to be completed in block letters)

Surname	Forename(s)	Matriculation Number
TAILEB	ALI	94e04002

Postgraduate Study (tick)	PhD	✔	MPhil		MSc	

Thesis Title

Sustainable Urban Systems and People Perception: with reference to Edinburgh and Ottawa

Signature: _____ **Date:** 15-05-2002

Abstract

In the past thirty years, cities have grown at a phenomenal rate. This abnormal growth is mainly caused by urban expansion that overwhelms the balance between natural resources and the morphological characteristics of each region. Today typical sprawling housing developments, shopping centres, highways and other developments emerged from design principles that did not originate from any sense of the environmental context or to humankind's relation to it. Many problems caused by urban growth, such as pollution, energy, segregation, sprawl and lack of social and cultural consideration have become unsustainable to the urban environment.

There are many publications that examine sustainability from an objective (physical) point of view, mainly as a set of problems to be resolved through advanced technology and progressive innovations. The author believes that there are many other aspects as important as the objective aspects in terms of people's subjective preferences, as attitudes and cultural aspects could contribute to sustaining the environment. Sustainability is approached in this thesis from subjective and cultural aspects which include values shared by collective minds.

The hypothesis of the research is achieved through people's perception of the built environment as a tool to understanding the man-environment relationship. The significance of involving people, their perceptions, needs and preferences from a more genuine point of view is trying to explore and understand in depth the hidden forces and values of things that maintain a sustainable system from the point of view of people. The study examines people's perception and satisfaction in two settings Edinburgh and Ottawa.

The orientation of this research is exploratory and relies on qualitative and quantitative research. Deductive inference explores in depth theoretical issues on the topic and analyses the principle of maintaining a sustainable urban environment by addressing the issue from the literature and the case studies. Inductive inference is adopted to maintain habitual notions and established values of the field survey by analysis of the collected data. The theoretical approach adopted in this research is that of transactional, cognition and perception. This combined approach assumes inseparability of context and considers people as a holistic entity.

The outcomes of this research identify major areas of contribution which relate to the discourse of sustainable urban systems. A contrast was evident in connection with land use, mixed uses and transport in the cases of Edinburgh and Ottawa, the former city being characterised by a more dense form than the latter's low-density, sprawling form. A strong appreciation between home-work relationships was evaluated in both samples. This research highlights the impact of subjective considerations on how peoples' maintain a sustainable urban environment.

Dedication

This thesis is dedicated to,

My mother for her help and support and my father.

My kind uncle and aunt who helped me achieve this work.
My lovely sisters Samia, Nacera, Nadia and my brother Farid.
To my dear aunt Nouara and zizi abdenour
To Farid Hamadene
And to all my family.

In memory to my dear grand-mother.

Acknowledgement

The author wishes to praise the Almighty Allah for making him able to accomplish this study.

There are a number of people who contributed to this dissertation and made it possible for me to complete it on time. I'd like to express my thanks and gratitude to all that helped me.

Firstly my thanks and utmost gratitude to my supervisor Dr Faozi Ujam, coordinator of MPhil/PhD programme of School of Architecture at Heriot-Watt University, for his support, guidance, encouragement and constructive comments regarding my thesis.

Secondly, I would like to express my gratitude to Lesley Forsyth Director of the Urban Design program for his support and help.

My special thanks and appreciation go to Husseim Rizk for his help, support and advice, to Hatem, Nabih, Sherif Feki, and Waleed Kaki.

My sincere gratitude to my fellow Ph.D and post graduate colleagues Wael Nabih, Sameh Feki, Yasser Adas, Mohamed Salheen and Ahmed Sedki.

Thanks also go to Daniel de Iongh and Pat Bryden, who assisted the work through corrections and edition.

I would like to thanks my friends in Algeria and in Edinburgh for their support specially Samir Aouane.

Table of Contents

Introduction

PART ONE THEORETICAL BACKGROUND

Chapter 1: Sustainability

Chapter 2: Transactional Approach

Chapter 3: Environmental Perception and Cognition

PART TWO CASE STUDIES

Chapter 4: Edinburgh and Ottawa

Chapter 5: THE QUESTIONNAIRE

Chapter 6:

Analysis

Chapter 7:
Correlation and Factor Analysis

Factor Analysis

Chapter 8:
Open-ended Questionnaire Analysis

PART THREE DISCUSSION

CHAPTER 9: CASE STUDY OUTCOME

List of Figures

Introduction

Chapter 1

Chapter 4

Chapter 5

Chapter 6

Chapter 7

List of Tables

Chapter 5

Chapter 6

Chapter 7

Chapter 8

Introduction

INTRODUCTION

The aim of this section is to investigate the sources of the concerns that gave rise to the subject of the thesis.

The author is an architect and an urban designer. His passion is in contributing knowledge of how to create a sustainable environment led him to the research. The author's main concern has been to look at people's perception of and their relationships to the environment.

The following part argues that the problem that characterises cities now can be identified as pathological non-responsiveness to the environment. It will be followed by a clarification of sustainability theory as a way to encourage a more responsive attitude to preserving and protecting the environment.

0.1-Urban Growth and the Urban Environment

In the past thirty years, cities have grown at a phenomenal rate. This abnormal growth is mainly caused by urban expansion that destabilises the balance between natural resources and the morphological characteristics of each region. In most parts of the world, the twentieth-century can be called the 'era of urbanisation'. World population, currently about 5.3 billion, is expected to at least double in the present century. The United Nations Fund for Population Activities (UNFPA) expects that up to 90% of this increase will be experienced in urban agglomerations (Girardet H, 1992).

The proportion of humans living in cities is also rising. In 1990, just 15 percent of the world's people were urban. Today the figure is closer to 50 percent and by 2025 it is likely to be at least 60 percent. The cities of the world consume 75 per cent of its resources and produce most of its waste (Girardet H, 1992).

Cities in the north are growing at a slower race but are responsible for a disproportionate ecological effect because their citizens are consuming ten times more per capita, and produce up to four times more refuse, than their equivalents in the south (Ibid.). In the words of Herbert Girardet: "*the inherent selfishness of modern city living makes urban growth a global cause of concern. Cities are giant abusers of Gaia and they have little awareness of the consequences of exploiting her*" (Girardet H, 1996: 67).

As mentioned earlier, the increase of the population is forecast to occur mostly in urban agglomerations which will have an impact on the urban environment. Haughton (1994) describes the urban environment as complexly structured and richly textured in its interweaving of a mixture of natural and built form, and of economic, social and cultural dimensions. He adds that the overall urban environment can be said to consist of natural, built and social components. The natural environment includes air, water, land, climate, flora and fauna, whilst the built environment encompasses the fabric of buildings, infrastructure and open urban spaces.

The social component embraces the intangible aspects of urban areas, including aesthetics and amenity quality, architectural styles, heritage and the values, behaviour, laws and traditions of the resident community (OECD[1]1990).

Odum (1989) claims that the city is a parasite on the natural environments. Peter Berg (1990) argues:

> *"Cities aren't sustainable because they have become dependent on distant, rapidly shrinking sources for the basic essentials for food, water, energy and materials. At the same time they have severely damaged the health of local systems upon which any sensible notion of sustainability must depend... In addition, the social systems that make cities liveable, such as a sense of community and wide civic participation are more typically eroded rather than strengthened"*
>
> (quoted in Haughton 1994: 24).

0.2-Problems related to Urban Growth

In this section the author looks at the problems generated by the growth of cities and which emerge from a lack of consideration of the context. These problems range from physical towards more social ones.

Today the cities of the developing world are outdoing their 'teachers', with more pollution and more human misery.

---

1 (OECD): Organisation for Economic Co-operation and Development.
In article 1 of the convention signed in Paris 1960, and which came into force in 1961, the OECD promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living, while maintaining financial stability;
- to contribute to sound economic expansion in members as well as non-members; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

Source: (OECD, 1994)

Lewis Mumford reminds us that "*The more complete the urbanisation, the more definite is the release from the natural limitations; the more highly the city seems developed as an independent entity, the more fatal are the consequences for the territory it dominates*" (quoted on Girardet, H 1992: 67).

0.2.1-Migration of population

Migration can play a central role in the urbanisation process, although its contribution to urban growth varies considerably between different cities and different nations (Haughton 1994).

Some 20 million people move to cities every year. From 1950 to 1990 the population of the world's cities went up from 200 million to over two billion, with three billion expected by 2025. What is the cause of this astonishing 'mobilisation' of people? Urbanisation based on industrial development, a trend that started in Europe and North America, is now gripping the world (Haughton 1994).

In developing countries industrial growth offers employment and trading opportunities for rural people faced with declining living standards due to lack of land, depleted rural environments and the industrialisation of agriculture.

Many authors have commented on population migration and its effects in defining the urban environment. One of those is Mumford (1963), who studied the formation of large cities in which enormous numbers of people were needed to fuel the creation of wealth. He associates the creation of a large megalopolis with the " *the slavery of large numbers*" (Mumford 1963: 528).

0.2.2-Major polluters and pollution

Today's cars are a major cause of air pollution. This affects human health and also causes significant damage to trees and crops. Air pollution from cars has been worsening worldwide. In the 1980s the economic boom led to a substantial increase in car ownership and car use in the developed world. In 1992, 600 million cars were in use worldwide (Girardet H, 1992: 102)

In Europe the liberalisation of trade is leading to a steady increase in long-distance lorry transport between urban centres (Girardet H, 1992: 102). The European Commission's task force on the environment has stated that it considers transport as the most important single source of environmental damage. But only about one-eighth of the social and environmental costs of lorry transport are actually paid for by the haulier (Ibid).

Noise pollution, vibration, accidents, demand for urban land to be dedicated for movement and parking and, above all exhaust emissions are paid for by society and by the natural environment.

0.2.2.1-The car

Cities built since the invention of the car are shaped by its presence and their inhabitants' reliance on it. Los Angeles, Brasilia, and Milton Keynes are three such cities. Their low-density layout reflects the planners' assumptions that people would all own their own cars, live highly mobile lifestyles, and drive great distances daily (Girardet H, 1992). This attitude takes no account of the elderly, the young, the poor and non-drivers. Such a freeway system that facilitates car movement also takes up more land.

> "*Worldwide, more than one new car is produced every second. Spend the night in bed and when you wake up the next morning 30,000 new cars will have been made while you were asleep. In 1989 world car production topped 35 million vehicles a year*" (Greenpeace UK, quoted in Girardet 1992: 105).

0.2.2.2-Air pollution

Urban areas are the major sources of many forms of air pollution, being centres of industrial activity, energy use, and car traffic. Miller provides a disturbing insight into the effect on human health of general air pollution by suggesting that as many as one-quarter of all deaths in children under five years old, world-wide, may be a direct result of air pollution (Haughton 1994).

Urban areas are almost inevitably associated with the highest air pollution levels and this is reflected in the greater risk to urban dwellers of developing diseases of the respiratory system. Air pollution damage to human health has economic consequences, as does its degradation of other resources and assets such as crops, forests, buildings and other materials.

0.2.2.3-Noise

Noise pollution can be regarded as atmospheric since noise uses the ability of air to transmit sound waves. Moreover, noise pollution is an increasing feature of urban life and has received growing research attention in recent years (Haughton 1994). While the more acute biological effects of noise on humans may still be confined to some working environments and leisure pursuits (e.g. those involving loud music), it is increasingly being

recognised as a serious threat to human welfare through irritation and stress, especially in urban areas (Ibid).

The major sources of noise pollution are road traffic, general neighbourhood noise, and planes. Noise pollution can have a variety of effects on human health and welfare such as high blood pressure, which may contribute to heart disease and circulatory disorders (OECD 1991).

Whilst it has long been acknowledged that urban air pollution can have profound effects on the environment at local and regional scales, for the first time it has become recognised that air pollution may now be capable of destabilising the global environment. The depletion of the stratospheric ozone layer and global warming (the so-called 'greenhouse effect') are perceived by many to be the most important contemporary threats (Haughton 1994).

0.2.3-Ozone depletion

High concentrations of ozone are known to cause many adverse environmental effects (Haughton 1994: 157). Ozone in the stratosphere plays a crucial role in regulating the amount of solar ultraviolet radiation received at the Earth's surface. Any significant increase in the amount of ultraviolet radiation received at the Earth's surface due to ozone depletion could have severe impacts on human health and the functioning of ecosystems, and may also contribute to climate change.

0.2.4-Energy

The current built form of cities is, in many nations, an outcome of centuries of development and represents a major cultural and physical investment.

The increasing sprawl of the city and the functional separation of activities have added to the demand for motor cars. This has led to more consumption of energy. Linking urban form and energy use, Sue Owens (1992) notes that:

- The shape of the urban area can lead to a variation in energy demand of 20%
- Density or clustering of trip destinations can bring about as energy saving of 20%, mainly by facilitating public transport

There is a strong relationship between land use patterns, overall transport demand and car use. Cars continue to make increasing demands on urban space, create major pollution problems and major urban congestion problems. Car travel has been increasing rapidly in recent years, mainly as a result of larger distances travelled per trip rather than more individual journeys, with longer journeys to work being the most important element of this increase (Haughton 1994).

In summary, the motor car has reshaped the twentieth-century city. On one level, this has been beneficial, allowing greater individual mobility for some, greater speed of movement of people and goods, and a growth outward from the city. On another level, the costs in terms of pollution, space consumption and the separation of urban functions have been enormous.

0.2.5-Economy

Cities and urban centres grow through their ability to provide more people with the means to earn a living. Urban growth is clearly related to economic growth. The influx of money and wealth attracts more people, therefore creating a growing need for housing and services that are provided for by the building industry. Similarly, a weakness in the economy will cause a decrease in pay and employment and tend to cause people to migrate.

0.2.6-Sprawl

In a 1978 paper entitled 'How large can cities grow?' Jean Gottmann posed the question 'Is there a limit to urban growth?'. Gottmann's main concern was the size to which cities and agglomerations could grow and how agglomerations could support themselves if the percentage of urban population continued to increase. He indicated that the problems of modern city growth like changes in economic function, land use, traffic density, and urban styles of living and working, were usually 'corrected by urban sprawl' (Mc Master, R 1993).

Urban sprawl relates to areas of essentially urban character located at the urban fringe, the outer limits to which a city, town or agglomeration has grown, but which are scattered, surrounded by or adjacent to undeveloped sites or agricultural uses (Mc Master, R 1993).

During the twentieth century cities have extended outwards, upwards and even downwards in ways never before envisaged. The internal structure of activities within the city has also changed markedly over time, across a range of dimensions, a trend which is especially evident in low-density sprawling metropolitan regions. These areas have been radically altered by a combination of the decentralisation of population and businesses, large-scale

exclusionary land-use zoning within the city, and the increasing amounts of space given over to the demands of the motor car. Amidst all these changes, the population densities of cities have also changed, most notably in North America, where low-density suburban sprawl has become almost a defining feature of their twentieth century development.

The low-density suburban sprawl found in cities in North America is frequently seen as the worst kind of urban structure (Haughton 1994). This form of suburbanisation is held by some to lead to atomised lifestyles which deny the emergence of a true sense of local community. Low-density suburbs of privately owned houses are seen as socially stultifying, where residents lead uniform, dull, conformist lives, in part because of the lack of social and economic diversity (Haughton 1994). The environmental implications of low-density urban sprawl which has characterised twentieth-century suburban expansion in some western nations and North America can be summarised as follow:

> *" - Consumption of large tracts of productive farmland for both housing and roads.*
> - *Increased energy usage and air pollution caused by decrease in viability of public transport, walking and cycling.*
> - *Increased energy consumption in single-storey, detached developments, because of poor thermal qualities relative to more compact housing form.*
> - *High per capita petrol consumption and resultant polluting car emissions"*
>
> (Haughton, 1994: 85).

Whatever the balance of environmental advantages, one thing is certain: low-density sprawl has been facilitated by the rise of road transport, especially the private car (Haughton 1994).

0.2.7-Segregation of activities

Zoning and separation of activities dictates that people must move daily from home to work and back again, which increases the consumption of energy and resources and effectively doubles the need for built up districts, calling for dormitory towns and working centres. Meanwhile, sprawling housing developments, shopping centres, highways and other developments have proceeded along design principles that did not originate from any sense of respect for the environment and humankind's relation to it. Breaking the linkage between the city and countryside has given the city the potential to grow and expand virtually without limit with a consequent increase in the consumption of energy and resources. This new structure of distribution has conditioned our behaviour; the accepted norm of short distances to work have been replaced by longer distances.

Jane Jacobs' book, '*The Death and Life of Great American Cities'* (1961), warns that land use segregation and low-density dispersal are killing off the diversity that is the basis of urban life. For Jacobs, the essential phenomenon of cities is the mixture of activities they support and encourage.

It is not the first time that cities have been diagnosed as pathological. A hundred years ago the unhealthy living conditions in the industrial city slums of Europe and, later, North America horrified social reformers. Vexed by the impoverished squalor of 1890s London, a court reporter and amateur utopian named Ebenezer Howard came up with a visionary and lovingly detailed plan for what was probably the first deliberately planned 'Green city'- the 'Garden City'. Howard believed big cities were doomed. He envisaged a series of new self-sufficient towns; built in the countryside, and surrounded by agricultural belts which would supply the inhabitants with food. The garden city would have its own industry to provide

local employment. Decades later, Howard's thinking was to be picked up a large scale by 'new town' developers across the globe. The American 'father of suburbia' Frank Lloyd Wright has a dream in the 1930s was to replace large dense cities with spacious low-density housing, linked by highways. He assumed that each family would own a car. This prescient plan was to become the sprawling reality of post-war North America and much of the rest of the world.

Le Corbusier also put mass car ownership at the heart of this plan for a 'Radiant City'. But instead of sprawling cities he went for towering ones on land traversed by great highways. Though radically different in their visions, Howard, Wright and Le Corbusier had three things in common. All in their way wanted to open up more green spaces. All revealed a will to order; to segregate human functions into separate areas for living, for working, for leisure. Finally, all were utopian.

Inspired by such ideas, post-war municipalities in Europe, North America, Australia, Asia and Africa bulldozed swathes of cities under the aegis of 'slum clearance'. In their place were thrown up segregated 'new towns'; sprawling, car-dependent suburbs of unrelenting monotony. No one had sought to ask the people who were to live in these places what their real-life needs might be, nor had there been any methodology established through which real needs could be interpreted from simplistic requirements.

There was, predictably, a backlash. One of the fiercest critics was the North American Jane Jacobs, who in the 1960s took to the utopians and their followers to task in no uncertain terms. Jacobs argued against segregation and uniformity and for variety and diversity, to enable cities to retain their natural, organic vitality. Pavements were important social spaces

where people could interact; older buildings gave character and should repaired not replaced.

0.2.8-Social and cultural considerations

The majority of built form today is found in large cities. These places are often associated with social problems, such as crimes. Problems found in big urban centres show strong similarities even in a developed country as in the case of New York.

Man is becoming more alienated due to lack of cohesion both socially with the group and with the urban environment. In pre-industrial society small, fairly homogeneous populations contained people who knew each other, performed the same kind of work and have the same kind of interests: they thus tend to look, think and behave alike, reflecting a consensus of values and norms of behaviour. In contrast, the inhabitants of large cities are subjects to new forms of economic specialisation and innovation in transport and technology. In this urbanised, industrial society there is contact with more people but close 'primary' relationships with family and friends are less easily sustained (Knox, P 1995).

The rise of consumerism and the propagation of materialistic values has been one of the dominant cultural trends. People have been made more materialistic as capitalism has, in its search for profits, turned away from an increasingly regulated realm of production towards the more easily exploited realm of consumption. Economic and technological change has induced a certain amount of cultural change, new modes of telecommunications have allowed the rearrangement of cities in ways never imagined before. One consequence of this is the attenuation of the meaning of place in people's lives.

> *"The outer experience is cut off from the inner experience. The new attempted urban meaning is the spatial and cultural separation of people from their product and from their history. It is the space of collective alienation and individual violence... life is transformed into abstraction, cities into shadows"* (Castells, 1983: 7).

Wirth attributed the social and psychological consequences of city life to the combined effects of three factors which he saw as the products of increasing urbanisation.

1- The increased size of populations;

2- The increased density of populations; and

3- The increased heterogeneity, or differentiation, of populations

Wirth draws a parallel picture of social change associated with the increased size, density and heterogeneity of urban populations. Social groupings resulting from economic competition and the division of labour result in a fragmentation of social life between home, school, workplace, friends and relatives; and so people's time and attention are divided among unconnected people and places. This weakens the social support and control of primary social groups such as family, friends and neighbours, leading to a lack of social order and an increase in social disorganisation (Knox, P 1995).

These are part of other problems, which are going to be addressed thoroughly in forthcoming sections of the thesis. There are more accounts associated problems specially when we address sustainability (see Chapter 1), as it guides us to interpret and deal with the empirical work.

0.3-Change of People's Attitude to the Environment

People's preferences can be best understood within the framework of the man-environment relationship. There is a mutual relationship between man and his environment. Each shapes and is shaped by the other.

At its broadest the environment can be defined as any condition or influence outside the organism, group, or system under study, while recent ecological thinking stresses the need to consider the organism within the environment rather than organism and environment as two separated phenomena.

Ittelson (1960) describes the environment as an ecological system with seven components:

1- *Perceptual,* in which individuals experience the world, is the principal mechanism linking people and environment;

2- *Expressive*, which concerns the effect on people of shapes, colours, textures, smells sounds and symbolic meanings;

3- The domain of *aesthetic values* of culture;

4- *Adaptive*: the extent to which the environment helps or hinders activities;

5- *Integrative:* the kinds of social groupings which are facilitated or inhabited by the surroundings;

6- *Instrumental*; which refers to the tools and facilities provided by the environment;

7- The general ecological *interrelationship* of all these components.

In a different formulation, Lawton describes the environment as an ecological system having four components.

1- The individual;

2- The physical environment, including all natural features of geography, climate, and man-made features which limit and facilitate behaviour, and the 'resources' of the environment;

3- Personal environment, including individuals who are important sources of behaviour control: family, friends, authority figures etc;

4- The social environment, consisting of social norms and institutions.

These, and other models proposed, have two things in common: firstly they suggest a multiplicity of environments – for example social, cultural and physical. Secondly they imply a link between changes in the physical environment which provides a setting for people and changes in other areas-psychological, social and the like (Rapoport 1977).

Detwyler and Marcus (1972) give another definition of the environment. They consider it as an aggregate of external conditions that influence the life of the individual or population, the life of man. This is an ecological definition that includes both physical and cultural components.

It is very important to bear in mind the way people and their culture affect the environment, and how the physical environment affects cultures and people. Altman and Chemers (1984) argue that people, culture and the physical environment are a trio that cannot be understood separately.

The relations between man, culture and environment are variable, and there have been several views on them. Ujam (1987) suggests that the problem has been the nature of the relationship between man and his ecological environment. The old answer was that the

physical environment determines human action or, in a broader sense, influences people in what they do.

One simple and broad definition of culture states that culture is the man-made part of the human environment (Assi, 1998: 5). However, there are several components of culture which we can say refer to beliefs, perceptions, values, norms, customs and the behaviour of the particular group or society.

The question is what might the effects be of the environments on people?
If there are no effects, or if these effects are minor, then the importance of studying man-environment relations is correspondingly diminished. It is also difficult to answer since the evidence is often difficult to compare, is contradictory and there is no consensus or generally accepted theoretical model. However, three positions can be distinguished regarding this, one of the three basic questions of man-environment research (Rapoport, 1977). The first is environmental determinism, the view that the physical environment determines human behaviour. This has been the traditional view in planning and design, the belief that changes in the forms of the urban environment can lead to major changes in behaviour, increased happiness, increased social interaction and so on. A second view holds the physical environment has no major effects on people but that it is the social, economic and similar environments which are of major importance. At most, to use a geographical analogy, it accepts the possibilist view, that physical environments provide possibilities and constraints within which choices are made based on other, mainly cultural, criteria. The third position is probabilism, the view that physical environments do, in fact, provide possibilities for choice but that they also constrain choice to the extent that some choices become much more probable than others in given physical settings.

Many of the problems stated of segregation, urban sprawl, urban pollution and urban energy waste have led the author of the research to the following questions:

- How could the built environment correspond more exactly to the interests of its users?
- How do people evaluate their environment and what are their preferences?
- How do people choose where to live, and what are the constraints on their choices?

As many writers acknowledge, the answer to most of these questions is ultimately to be found in the wider context of social, economic and political organisation. In short the city must be seen as a reflection of the society which maintains it. The study of the city should not be abstracted from its cultural and economic matrix, and a proper understanding of the city requires a cross-disciplinary approach. In the city everything is connected to everything else.

Thus the individual and the environment form a system and their mutual interaction is partly determined by the physical environment and other people, or more correctly, the individual perception and interpretation of these and their significance.

0.4-Objectives

A wide range of problems caused by urban growth, such as pollution, energy, segregation, sprawl and lack of social and cultural consideration, have become unsustainable to the urban environment. Many publications examine sustainability from an objective (physical) point of view, mainly as a set of problems to be resolved through advanced technology and progressive innovations which form the basis for solving problems of societies. As a result of the focus on physical aspects in place of the value systems, context, preferences, desires and expectations of people, many problems became a threat to sustaining the urban

environment. Therefore the researcher puts forward the following hypothesis.

0.4.1-Hypothesis

It is as important to address sustainability from a subjective point of view which comes from deep-rooted aspects, social, cultural values and the context embedded in people's value system and perception as it is to address it from an objective point of view.

Therefore to contribute to the existing discourse, sustainability is approached from subjective and cultural aspects which include people's preferences and values shared by their collective minds.

The hypothesis of the research is achieved though the following:

- Use people's perception of the built environment as a tool to understanding the man-environment relationship;
- Examine the contribution of a contextual approach;
- Unwrap issues and concepts related to sustainability;
- Contribute into the discourse on environmental protection and on sustaining urban environments associated with urban contexts; and
- Use such understanding to address the problems generated by urban growth;

The study approaches these objectives by examining people's perception and satisfaction in two settings, one European (Edinburgh) and the other North American (Ottawa) as a tool to fulfil the objectives mentioned above. The case studies have been used to expand and

enrich our understanding of how to maintain a more sustainable pattern of urban living, because in the end it is the people who are living and perceiving their environment.

Figure 0.1 (see next page) represents sequences of the progression of the thesis. The first step is mainly to identify the concern of the research. The second, third and fourth steps relate to an investigation of theoretical background of theories of sustainability, perception, cognition and transactional approach. The fifth step is the analysis of the case studies of Edinburgh and Ottawa as a way of investigating people's preferences and perceptions of their environments which is followed by a conclusion and recommendations.

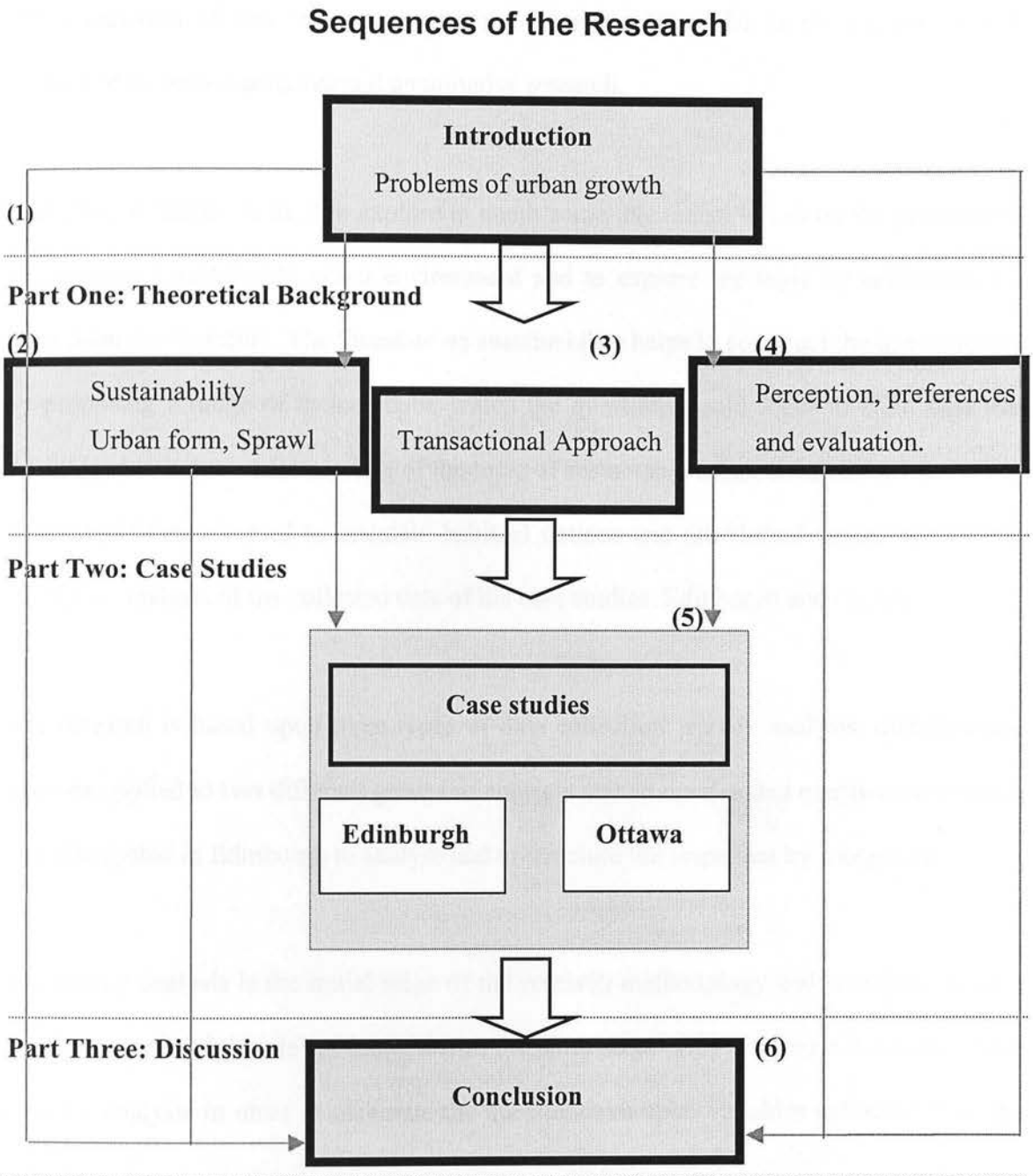


Figure 0.1 Sequence of the Research

0.5-Methodology

The orientation of this research is exploratory and relies as far as the methodology is concerned on both qualitative and quantitative research.

Deductive inference is used to explore in depth some theoretical issues on the principle of maintaining a sustainable urban environment and to explore the topic by addressing the issue from the literature. The literature on sustainability helps to construct the questionnaire by proposing a range of themes upon which the questions could focus to elicit data that would lead to better understanding of the topic of sustainable urban environment. Inductive inference is then adopted to maintain habitual notions and established values of the field survey by analysis of the collected data of the case studies, Edinburgh and Ottawa.

The research is based upon three types of data collection: survey analysis, questionnaire analysis applied to two different groups of subjects and an open-ended questionnaire which was distributed in Edinburgh to analyse and to structure the responses by categories.

The survey analysis is the initial stage of the research methodology and is conducted on a smaller sample (10 people) of subjects than the latter stage. This is because it requires more time for analysis in order to elaborate the questionnaire upon variables extracted from the sample.

The questionnaire analysis is the second part of the research methodology and applies various kinds of Analysis (Frequencies, Correlation and Factor) on data collected from a sample of subjects (55 in Edinburgh and 37 in Ottawa). The choice of subjects was based

on a randomly selected sample and many of the questions were fixed choice. The analysis relates to human perception and it therefore sets out to determine how people in the two settings perceive their environment.

The open-ended questionnaire was distributed for the people in Edinburgh, the purpose was to have more insights from people's responses and also to what extend people's perception are grouped into categories, it enable us to have a better understanding on how to sustain the urban environment.

0.6-Thesis Structure

The thesis is divided into three parts. Part One is the theoretical background examining theories of sustainability, the transactional approach and perception. Part Two is more specific and orientated to the analysis of the case studies. Part Three is an overview of the results. The three parts are briefly described below.

Part One involves a review of the theories on sustainability with emphasis on architecture and urban design. It highlights some of the principles adopted by governments to encourage a sustainable environment (Chapter 1). Chapter 2 describes the Transactional approach as a way to understand people-relationship with their environment. Perception is also introduced in this section as a tool to understanding the relation between man and the environment (Chapter 3).

Part Two involves the case studies of Ottawa and Edinburgh. It introduces both cities to give an idea about their backgrounds. There is a description of the current urban development of the cities (Chapter 4).

A questionnaire that aims to understand people's perception is introduced in this part which describes the different techniques used for the analysis (Chapter 5). This part also analyses the responses from the main samples in Edinburgh and Ottawa. Chapters 6 present the analytical part conducted on a larger sample of subjects through the analysis of the questionnaire. Chapter 7 attempts to understand people's preferences associated with their own city by using Correlation and Factor Analysis.

Chapters 8 analyse the open-ended questionnaire which was distributed on Edinburgh's samples attempts to classify responses of people's perception by categories and groups.

Part Three introduces certain areas and notions of concern that were defined and observed though the main findings of the research (Chapter 9). The results of investigation through the research are summarised and recommendations presented regarding the future of the built environment derived from the different key factors in the process.

Part One

Theoretical Background

Chapter 1

Sustainability

CHAPTER 1

SUSTAINABILITY

1.1-Introduction

The aim of introducing sustainability in this chapter is to shed more light on the nature of the problems caused by urban growth which has had many impacts on the urban environment such as: urban pollution, waste of energy and segregation of activities. This Chapter also looks at definitions of sustainability which have been promoted by international groups and adopted by national governments to encourage a more sustainable living.

Sustainability is increasingly emerging as one of the major contentious issues in national and international policy. It is discussed both in 'developed' and 'developing' countries and at governmental and non-governmental organisation levels. Its relevance is being recognised across many disciplines: economics, the social sciences, ecology, politics, agriculture and tourism to name but a few. Each discipline has its own outlook, not only of the problem of non-sustainability but its remedies (Nabih, W.1999).

Nabih, W (1999) argues it is also important to note that the concept of sustainability embraces the notion of the environment as a holistic cross-disciplinary system and not a fragmentary entity. In the global political arena, one of the most urgent areas of interest is how to best tackle the problem of climate change, a core problem that demands an international approach. The realisation that the survival of the human race is likely to be severely affected by climatic disruption gives the issue unprecedented importance and has propelled awareness of the significance of sustainability far beyond the domain of the

politician and into the public domain. It is however essential to realise that its implications go far beyond the single climatic issue, involving all disciplines in order to achieve the common goals of sustaining the environment of the earth.

1.2- Origins

Cities have long experienced environmental problems, not least in respect of overcrowding of air, water and noise pollution and of poor sanitation and poor housing. Such long-recognised problems persist in virtually all cities, but they are also being added to, as it becomes apparent that urban problems are intimately tied up with the concerns of global environmental sustainability.

Sustainability is strongly associated with, and has its origins in, environmental protection, particularly protection of our atmosphere from global warming. The political concept of sustainability originates further back, to the environmental movements that first drew attention to the problems of climate change, then understood to constitute global warming. It must be acknowledged that the environmentalist was the first to bring light to many ideas that have since become incorporated in mainstream discussion.

The direct action group, Greenpeace, has become perhaps the major international environmental watchdog. It demonstrates an extremely radical stance when opposing governmental positions. Popular support for the organisation world-wide reflects an international recognition, not limited to the US and Europe, which calls for a need for environmental protection and awareness of large-scale issues.

Such sentiments are matched and recorded in the literature of some of the great thinkers of the twentieth century. Patrick Geddes (1854-1932), a Scottish town planner, is also considered to be one of the instigators of environmental thinking and recognised as a father of 'modern sustainable planning' (Lord Provost's Commission, 1998: 7) for his ability to clarify the interrelationships between natural systems and human activities. He visualised human activity as an integral dimension of the natural ecosystem.

1.3- Definition

The Oxford Dictionary (1982) states that to sustain something is *to "to enable to last out, or to keep going continuously*". Therefore sustainability is the ability to sustain.

Sustainable development is a phrase which quickly entered into the common vocabulary with the heightened environmental awareness of the late 1980s. There is no commonly accepted single definition of sustainable development (Haughton 1994: 16). The most widely cited definition is that of the world commission on environment and development (WCED[1] 1987), also known as the Brundtland Commission:

> *"Sustainable Development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED 1987: 43).

'Sustainable development' is not the only term to be used to address sustainability, but also 'sustainable growth' and 'sustainable use'.

Edwards (2001) Adds on saying: *"The Brudtland definition of sustainable development is increasing seen as a virtuous but imprecise concept open to various and often conflicting interpretations, although it remains the global standard"* (Edwards, B 2001: 7).

---

1 World Commission on Environment and Development.

He adds, "*the Brundtland definition outlines a philosophy which benefits from a degree of imprecision. There is a general understanding and set of principles which allow useful sub-definitions to be framed within its broad embrace*" (Ibid).

There are three important concepts in the Brundtland definition and associated report. The first, which concerns the breadth of sustainable development, has three dimensions: environmental; economic; and social sustainability. It follows that sustainable development is about maintaining and enhancing the quality of human, social and economical life and of the environment while living within the carrying capacity of supporting eco-systems and the resource base (Barton, H 1996: 13).

Further to this argument, sustainable development should be change that is brought about so as to reach an environmental equilibrium that has the capability of being sustained into the future. This state is not only expected to achieve the physical objectives of a sustainable use of resources and sustenance of healthy climatic conditions, but also of quality of living.

1.3.1-Grey and green culture

The Green Dictionary defines sustainable as "*able to continue indefinitely, the capacity to continue indefinitely*" (quoted in Cooper, I 1993: 2). It states that,

> "*Sustainability requires devising ways of life which are dependent upon the mutual interaction of humanity with the current account renewable resources of the ecosystems of the biosphere... we need to design suitable life structures which function as self-sustaining systems, consciously connected to Gaiaostatic feedback loops, so that human activity contributes to the dynamic balance of the whole*" (Ibid.).

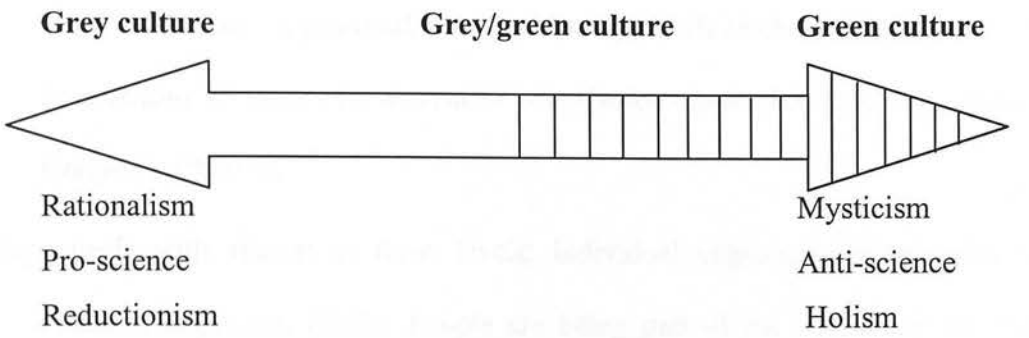


Figure 1.1 Spectrum of grey to green cultures (Source Cooper 1993: 2).

Cooper (1993) states that our global predicament is the result of grey culture - which is the pursuit of continued economic growth through increased industrialisation based on consuming ever-increasing amounts of finite resources. This has to be replaced by green culture - based on the rationalisation of consumption, moving towards maximising the utility of finite resources by means of re-use, repair and recycling, conservation and ambient energy measures, along with the purposeful reduction in human numbers (Cooper 1993).

There are so many ideas and pre-conceived starting points wrapped up in these definitions and prognostications that they are difficult, at first sight, to unpack. One way of doing this, and so to recognise the very particularised definition of sustainability that is being offered, is to turn back to ecology. For this is the discipline from which green culture drawns so much of its vocabulary and borrows so many of the bases of its ideas (Cooper 1993).

As a science-based discipline, ecology is, according to Begon *et al.,* the study of:

> "*The distribution and abundance of different types of organisms over the face of the earth, and about the physical, chemical but especially the biological features and interactions of these that determine distributions and abundances*" (quoted in Cooper, I 1993: 2).

Ecology deals with species at three levels: individual organisms, populations and communities of organisms (Ibid.). People are being part of the whole system which contribute into sustaining the environment are not be dissociated. People are in mutual interaction with its surrounding and specifically with their urban environment. This notion will be addressed in the coming section in the chapter on transactional approach.

1.4- Sustainability and Sustainable Urban Development

Many authors see cities as being parasitic on their hinterlands, and therefore unsustainable. Peter Berg (in Haughton 1994) for instance, argues that:

> *"Cities aren't sustainable because they have become dependent on distant, rapidly shrinking sources for the basic essentials for food, water energy and materials. At the same time they have severely damaged the health of local systems upon which any sensible notion of sustainability must depend...In addition, the social systems that make cities liveable, such as a sense of community and wide civic participation, are more typically eroded rather than strengthened"*
>
> (Haughton, 1994: 24).

Others have emphasised the potential for changing the internal economic, social and spatial organisation of the city. This level of approach is particularly important in transforming existing large cities which have evolved physical characteristics that run counter to the imperatives of sustainable development.

Sustainable urban development must aim to produce a city that is 'user friendly' and resourceful, in terms not only of its form and energy efficiency but also its function, as a place of living (Haughton, 1994: 25).

Sustainability and environmentalism are closely related. While the latter is the outcome of relatively more radical and unofficially recognised groups, sustainability has been addressed mainly by governmental and other official bodies. However, it has become evident that only action by world leaders could bring about the scale of change needed in order to save the planet from irreversible damage to its environment. This led world leaders to meet for the Earth Summit in Rio de Janeiro in 1992 (Ibid.).

Suburban growth generates a crisis of many dimensions: mounting traffic congestion, diminishing affordable housing, decreasing open space and stressful social patterns. Household makeup has changed dramatically; the workplace and workforce have been transformed and serious environmental concerns have surfaced. Cities are spreading over the natural landscapes faster than population increases or economic progress require, while older urban districts with their valuable infrastructures are underused or abandoned (Nabih, W 1999).

The next section defines goals, objectives and methods of sustainability. These are based on the commonly accepted ideas of the concept, particularly those discussed by the UN and other international bodies.

1.5- Principles of Sustainability

After more than half a century of focusing on economic growth as a means to improving humanity's condition, the international community has begun to realise that economic

development is damaging if it undermines its natural and social foundations. Because unrestricted economic development pollutes the world's air, water and soil, decimates forests and natural resources, creates toxic waste and overflowing landfill sites, then must examine other options. The interest in sustainability arises out of a desire to increase the quality of life and opportunities that economic development can bring, yet to find ways to do this while preserving the environment for future generations.

Conventional approaches to economic development, transportation planning and development of the built environment: sought to increase residents' opportunities and quality of life. They are now widely recognised to have created a variety of problems that society would prefer to do without: congestion, sprawl, air pollution, overflowing landfills, resource stress and other environmental and social problems. If the same approaches that created these problems are continued, the cost is likely to further degrade our own quality of life and give rise to increasingly insurmountable environmental problems for future generations.

Sustainable development is a far-reaching approach to repair and avoid these problems. Sustainability is an ongoing process and something to strive for, rather than a static set of characteristics.

1.6- Goals of Sustainability

Sustainability as defined in the literature and by the UN attempts to cover as much as possible *environmental, social and economical* goals (Nabih, W 1999).

Reduction of pollution, promoting a healthy living, and maintaining the natural environment for all to enjoy, significantly improves the quality of our lives. This means that the *environmental* objective has a large role to play even if environmental protection is not

the underlying concept.

Social goals would be to enhance social life, social cohesion, a sense of community and citizenship and interaction, as well as promoting life styles that do not alter our environment. This could include less use of private cars with more recycling and the use of recycled materials.

Economic goals, seen in the light of environmental objectives, would include finding economic activities that are less polluting; the production of recyclable products and diverting the benefits of economic growth to pay for the provision of environmental protection

The wide scope of these goals should not lead us to disregard the concept of sustainability. Although this wide scope can be seen as a fault, it provides a unique opportunity to produce a much needed and more holistic approach to solving global problems within one framework.

1.7- Goals

This section record major goal each in their relative category as found in literature. The objective is not to list all goals for they are constantly being changed and added to. The objective is instead to provide clarity to a wide-ranging theory and help in producing an overall understanding. The author must also take into account that the three dimensions of goals contribute to each other.

1.7.1-Environmental goals

Environmental goals refer here to protection against the destruction of the natural environment. It is mentioned in the previous section that there are three distinct points of view as to what sustainability entails. The environmentalist concentrates on ecological goals, but also considers economic and social goals, although sustainability appears to be largely dominated by 'pure environmentalist ideology'.

Destruction of the natural environment can refer for, example, to the destruction of the rain forests through logging or for clearing the way for development purposes. The main cause of this is urbanisation and urban sprawl. Increased urbanisation brings with it an increased need for transport and roads. In this way the urban environment claims the natural through building development and through road construction. Development can therefore become a direct threat to our natural environment. Similarly urban sprawl, as in the case of major Northern American cities, is a vehicle that accelerates this process.

Pollution can be divided into urban and industrial. However, industrial pollution is usually identified in the context of urban pollution, because industrialisation is invariably accompanied by urbanisation. In the light of this, the question of how economic activity is structured within the urban fabric is of importance in the struggle for a reduction of pollution. Pollution resulting from residential activities, in the form of sewage wastes and automobile exhausts, differs from the wastes of industrial activities, often having highly toxic by-products in liquid, solid and gaseous form, including carbon oxides. Ultimately, the environmentalist aims to minimise, if not eradicate, all pollution.

1.7.2-Social goals

Attributed to social goals in the literature of sustainability is the direct improvement of the quality of life and therefore the contribution of built form to it. The social dimension is where many old concepts from different disciplines combine without much alteration because of association with quality. Some are probably only associated with sustainability by the international organisations many of which have very little to do with the built environment.

It is a common belief among advocates of sustainability that in order to achieve their goals, encouraging the citizen, the family and local community to take responsibility is essential. Through the encouragement of responsibility, objectives have evolved, not only as a means to achieving the broader social goals, but as goals themselves that will enhance quality of life. The aim is not just to improve the environments in which people live, but to stimulate their involvement towards that end. Habitat[2] identifies roles for the individual citizen and family in its principles.

Social cohesion, exchange of information and social interaction are main objective for a truly sustainable environment as David Engwicht reminds us:

> *"Cities were invented to facilitate exchange of information, friendship, material goods, culture, knowledge, insight, skills and also exchange of emotional, psychological and spiritual support"* (quoted in Murrain, 1993: 85).

He asserts that, for a truly sustainable environment, need to maximise this exchange whilst minimising the travel necessary (which is addressed in the coming sections) to do it. All this implies as much variety of activity as possible and easily available within a reasonable

2 The Habitat Agenda of the UNHCS (United Nations Centre for Human Settlements).

walking distance of where people live and work.

Social and cultural values are also recognised in the goals of sustainable development. They are a basis for social cohesion and stability and thus are essential for reaching social objectives. These can be achieved by sustaining cultural heritage in the form of architecture and important historic sites, thereby supporting other cultural activities such as festivals or the continuing production of old crafts facilitated in the built environment.

Quality of life[3] is one of the most used terms in discussing sustainability as noted in the Habitat Agenda. It has therefore to be recognised as a goal, despite its generality and vagueness. The term can be used to include anything, whether it be good or bad and can be taken to include all social, economic and environmental goals. This characteristic helps establish an inclusive approach.

Harold (1986) argues that: *"the quality of urban life is always concerned with whether people live well or poorly, is life easy or hard? Are people satisfied or dissatisfied? Does the city help them realise their purposes and desires, or does it thwart them?... when we ask the more specific questions of what we must do and how we must go about improving the quality of urban life, it is then that very different meanings that have accrued to this concept are revealed. It may range from an emphasis on adequate services for those who live in the city, to concerns with economic matters including employment, income, and future economic development, to concerns with the level of satisfaction of family life and other social interaction*" (Harold, 1986: 21).

3 The concept of "quality of urban life" emerged during the late 1960's and early 1970's when environmental crises became a major issue around the world.

1.7.3- Economic goals

A strong economy is of particular importance to Third World countries and poorer localities. Sustainable growth for the foreseeable future is a valuable goal for the developing nations. Similarly, due to the increased costs of restructuring needed to change to ecologically friendly practices, economic growth is needed. These arguments are put forward by economists advocating sustainable growth, namely improving the standard of living and paying for environmental protection. Economic growth has also to address the more urgent problems of urban population growth, one of the most significant and persistent problems facing sustainability and which economic growth attempts to satisfy. Population increases have led to pressures to provide shelter and adequate living standards (Nabih, W 1999).

In discussing the built environment, the economy can be viewed as a means for providing money to make more housing schemes and provide more facilities. Economists subscribing to economic growth create the false belief that cities can grow forever and still be sustainable (that is, economic and urban growth go together) (Nabih, W 1999). Realisation that an increase in the growth of large cities is not sustainable is becoming apparent:

> *"Very large cities are held by some commentators to be almost inherently environmentally unsustainable"* (Haughton, 1994: 31).

Urbanisation can have different meanings for different people. It could mean the provision of good living conditions, as well as the maintaining of the natural environment. It must not mean just the provision of shelter and services and it should not cause climate change, and ecological destruction. These are the ill effects exhibited by megalopolis cities, but not necessarily of urbanisation itself.

Excessive increases in size are often accompanied by urban sprawl and increases in transport distances and therefore increase in car emissions. Other features may be a reduction of urban quality within city centres and the existence of slums, ghettos and general urban decay. Although this can not be generalised, these are more often than not the consequence of excessive size of the urban environment.

The first feature relates to the development of new industrial technologies that are environmentally friendly and non-pollutant. These technologies are still emerging. New technologies should use cleaner energy sources for production, produce less pollutant - by products, and make recyclable products and by products that create less waste.

Geiser defines some social goals in the form of the quality of working conditions, and wider social goals in meeting needs and limiting wants. Other social goals that the economic activity might achieve are the improvement of working conditions and the *home/work* relationship, which is significant at the social level in increasing free time and on the environmental level in reducing travel distances (Nabih, W 1999).

Another goal relates to the sustenance of the economy and economic activity. This refers to the level at which a local economy can be maintained, as expressed in terms of local employment and community livelihood. This objective differs from the first, which attempts to create growth of the economy. It also refers to the kinds and forms of activities that are locally sustainable. It is usually identified with achieving local economic self-reliance. It aims at preventing community dislocation and migration from one area to another or what Schumacher termed "footloose" (ibid).

1.8- Sustainable Architecture and Methods

Researchers can integrate principles relating to sustainability in the built form into planning, urban design, and design principles. They can also target the three sustainability goal areas (ecological, social and economical). Presentations of common methods that are intended to promote sustainability in one way or another follow in this section. There are many initiatives that can be regarded as promoting sustainability. However, a number of these are unique to achieving it.

It is significant to note that old architectural ideologies can fit into the sustainability theme through their intention towards to improve people's lives. It is therefore important to be careful when linking architectural ideas and theories with sustainability. Sustainability includes a number of distinct themes to which architecture can contribute, as follows:

1.9-Urban Form Initiatives Associated with Sustainability

1.9.1- High-density living

During the twentieth century cities have extended outwards, upwards and even downwards in ways never before envisaged. The internal structure of activities within the city has also changed markedly over time, across a range of dimensions, a trend which is especially evident in the low-density sprawling metropolitan regions.

Figure 1.2 High-density living. (Source: Urban Design, 1994: 38)

The question of density is a crucial one, particularly in countries that have shown strong signs of urban sprawl such as the US and Canada. This is one of the most discussed concepts regarding

urban form and sustainability. Increase of density is inversely proportional to the use of the automobile, the primary obstacle to sustaining the natural environment and achieving ecological goals of sustainability. Arguing in favour of high density living, many contributors and policy makers within the sustainable urban development debate claim that the compact-city solution helps reduce the tendencies to peripheral urban sprawl and also stimulates urban dynamism and vibrancy (Haughton1994: 81). Urban Sprawl also means that there is much valuable time spent in commuting at the expense of social activities, negatively affecting the quality of life.

It seems that in order to achieve the right balance between high and low density it is necessary to experience these opposite extremes. Hopefully now a good balance can be struck which satisfies local conditions. The Commission of European Communities recognises an absence of public life and monotony in periphery areas in contrast to high-density inner areas (Haughton 1994: 83). These features are particularly linked to North American and Australian settlements. It is suggested that this form of urban environment is the result of a strong car lobby in the United States which advocates urban sprawl to increase car sales (Haughton 1994: 81).

1.9.2- Mixed land use

Sustainability heavily concerned about the extravagant use of finite resources and the efficient management of the ecosystem: greenhouse gases, storm water pollution, efficient food production and so on; as well as fundamental concerns for social cohesion and social interaction. No less important, but perhaps on a smaller scale and more pertinent to the role the urban designer can play, sustainability is about structuring town form such that the individual has choice but never at the expense of the collective, thus empowering as many of the citizens as possible successfully to determine the outcome of their daily lives in so

far as the layout of the town and the location of uses can assist.

Mixed use and high density often go together as do sprawl and homogeneity of use. This is due to the evolutionary cycle that many urban forms have gone through. As a result of industrialisation urban centres have grown in size to accommodate the labour needed. This industrialisation triggered shantytowns where form is of high density and mixed use. This scenario created opposition to high density and mixed use because of association with poor living standards. However, advocates of high density and mixed -use point not to this example but to the formation of relative high density and mixed use found in traditional urban environments, such as those found in small towns and some inner city areas where social cohesion and a strong sense of community can be found. This form was replaced with a need to expand settlements fast with the introduction of large factories.

Both high density and mixed-use urban environments are options for decreasing the need for automobile transport, and therefore not only decrease gaseous emissions but also the need for road construction. They also achieve some social goals in that they create an urban vitality and promote social cohesion to some extent (Jacobs, J 1961), in addition to increasing availability of time for social activities and community interaction.

Many efforts have been oriented toward solving problems associated to urban growth and urban expansion of cities as well as to improve their well being. Architects, town planners have come up with many positive suggestions dealing with the urban environment. This section shed light on earlier enforcement by a thinker on the aspects of sustainability which is Patrick Geddes.

1.10- Contribution to Patrick Geddes

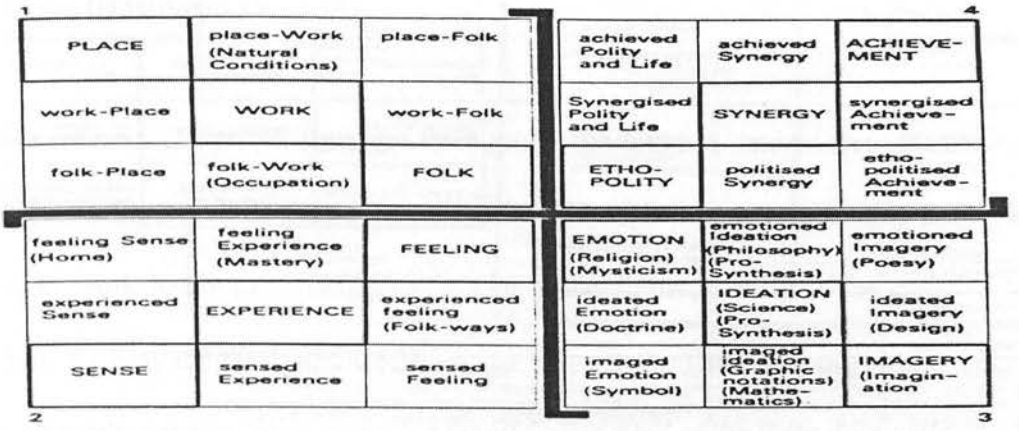


Figure 1.3 Geddes's 'Thinking Machine' (Source: Boardman, P 1978: 474)

Patrick Geddes (1854-1932) is recognised internationally as one of the fathers of modern sustainable planning, lived and worked in the city of Edinburgh for many years and helped shape Edinburgh's urban environment (Lord Provost's commission, 1998: 7).

Around the turn of the century, Patrick Geddes, a Scottish botanist better known as the 'father of town planning', developed the first matrix for urban analysis in 1927. The second was the C.I.A.M (Congre, International, d'Architecture, Moderne) grid, invented a generation later in 1934 by Le Corbusier, a French architect and urbanist who practised throughout the world. Then, in the mid 1950s, C.A. Doxiadis conceived 'Ekistics', the science of human settlements, and devised a grid to represent it. Symbolically, each of these matrices encompasses all that is necessary for analysis of urban problems and also sets the framework for new developments. Patrick Geddes, who called his grids 'diagrams', operated them as true matrices: ordinate and abscissa were identical and the resulting nine squares represented the various relationships between the three concepts (see **Figure 1.3**). For example, 'place work' represents natural resources, 'place folk' the working population. The total represented a synthesis of interaction in one town (Boardman 1978: 18). To Geddes, his diagrams were 'thinking machines' - means for checking that everything relevant has been taken into consideration. But Geddes was supremely

interested in the improvement of the environment of towns. And from thinking he moved to action (Boardman 1978: 18).

There are common properties in the three grids. The first two derived from the work of the frenchman Frederick Le Play (1806-82) who, although trained as a mining engineer, did pioneer work in the methodology of social research, particularly in the study of family budget. Le Play emphasised the relationship between the family, its physical environment and its work patterns. '*Lieu, travail et famille*' were cited as the three dominating forces of society. This trilogy was directly taken over by Geddes as 'place, work and folk'. The connection is less direct in Le Corbusier's four functions of land use: '*Habiter, travailler, cultiver le corps et l'esprit*', and '*circuler*' (live, to work, to cultivate body and spirit, to circulate). Thus, the ordinates (vertical axis) of the three grids are very similar.

The Le Corbusier grid was first used as the standard key to a comparative analysis of thirty-three cities prepared by delegates from eighteen countries for the fourth C.I.A.M (Congre International d'Architecture Moderne) held in 1934. This congress produced the Charte d'Athene, a series of statements and recommendations in which the same four functions were used as the main headings. Among the audience at the final session of this congress of Athens was a young Greek architect, C.A Doxiadis. He was greatly impressed by the ideas put forward and, twenty years later, he developed the five ekistic elements: Nature, Man, Society, Shell, and Networks. Thus the ordinates of the three grids are very similar:

Geddes	**Le Corbusier**	**Doxiadis**
Place	Recreation	Nature and Shell
Work	Working	Society
Folk	Living	Man
-----	Transportation	Network

Figure 1.4 Three Type of Grids (Source: Boardman, 1978: 18)

1.10.1-Geddes' impact

Geddes influenced the urban planning movement in many different ways. His work on regional surveying influenced Lewis Mumford and numerous others. Mumford, however, did not totally accept Geddes' ideas on social reconstruction. Yet, the method of considering social implications in city planning has carried over to the sustainable city projects of today. Geddes' understanding of the connection between the individual and the environment, as described in his last major work, *Life Outlines of General Biology*, constitutes the core of modern planning.

Geddes' work on regional surveys, cultural evolution, and urban sociology has become even more significant since his death.

The French influenced Geddes in many other ways. He learned about the geographical concept of regionalism, a concept which would lie at the core of his urban studies. Geddes was impressed by Comte's evolutionary development of science, which placed the social sciences above mathematics, logic, physics, chemistry, and biology (Boardman 1978).

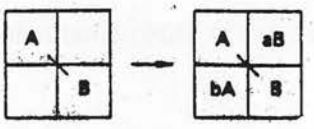


Figure 1.5 Any two factors in social life have two sub-relations. (Source: Boardman, 1978: 468)

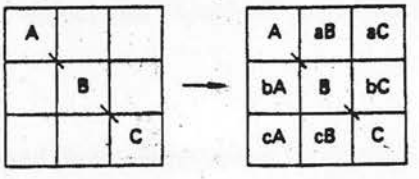


Figure 1.6 Any three factors in social life have six sub-relations. (Source: Boardman 1978: 468)

The author would like to emphasise the properties of Geddes' basic and most complex thinking machine, which is quite different from the other two grids. Geddes is quoted us saying in '*A Proposed Co-ordination of the Social Sciences*' ('Sociological Review', January 1929). "*In general terms, any two factors in social life have two sub-relations*". Similarly, in general terms, any three factors in social life have six sub-relations. The next step is to substitute triads of social factors for A B C, which leads to the 3 x 3= 9 squares and then to 9 x 4 sets of such triads = 'The 36-Chart' (Boardman, 1978: 468) graphically this may be expressed as in **Figures 1.5 and 1.6.**

The movement from one quarter to another corresponds to facts easily verifiable. The triad Place, Work and Folk, both alone and with it's six correlation. Here the study of place grows into geography; that of work into economics; that of folk into anthropology. Folk without place and work are dead.

Sense, Experience, Feeling, it is with our senses that we come to know our environment, perceiving it and observing it. Feelings are obviously developed from folk in earliest infancy by our mother's love and care. Thus to the chord of elemental and objective life corresponds exactly to the elemental chord of subjective life (Boardman 1978).

To understand things in the world without, or thoughts in the world within, we must take them together. Yet this must happen no longer merely in the too abstract terms of 'subject' and 'object', but as subject-object and object-subject in perpetual interaction.

Geddes' busy mind developed three-dimensional "thinking machines," which synthesised knowledge from geography, economics and anthropology. These thinking machines attempted to show the inter-relatedness of different areas of the social sciences. Geddes was

also interested in 'civics', which studied the relationships between individuals and the environment. He believed in the earth as a cooperative planet where people should be taught how to treat their environment properly (Boardman 1978). Specifically, Geddes' web of life aimed to: 1) educate children; 2) improve the physical quality of people by using new biological knowledge to produce better medicine; and 3) understand the human influence on ecology. These ideas led to his notion of Utopia, a Utopia which was realisable here and now (Boardman 1978).

At the time Ebenezer Howard was working with his Garden Cities movement, Geddes looked at the problems of existing cities. Geddes wanted to provide a link between social reform and the urban environment not only in small towns, but also in large cities. When the 1909 Town and Planning Act was passed, it required local officials to survey the local areas before undertaking any planning. Thus Geddes published a general survey method despite his opinion that each city and its culture are unique.

Geddes has set a method dealing with the urban problems and also set a framework based on ecological/ environmental and social aspects. Many aspects of his framework are still employed nowadays to solve specific problems.

1.11- Energy and Sustainability

No discussion of sustainability can ignore the critical relationship between sustainable design and energy use. Efficient use of resources is a central tenet of sustainability; the most efficient use must be made of every input, and all outputs should function as some form of input for other elements within the system.

Schumacher argued that urban expansion had only been made possible by the removal, predominantly through the use of non-renewable fossil fuels, of tight constraints on agricultural productivity and mobility, implying that urban sustainability was in question unless alternative sources of energy could be found.

Energy is a crucial resource, and the currently dominant forms are not renewable. They are associated with many serious environmental impacts, including urban air pollution, regional transfrontier problems like acidification, and global-scale impacts, the most important of which, as far as we are currently aware, is the enhanced greenhouse effect. Town and cities are major energy consumers (Breheny 1992: 79).

Throughout history, the nature and availability of energy resources have influenced the distribution of human activities and urban form. During the twentieth century the absence of energy constraints has had the most marked impact: in much of the developed world, falling real energy prices have permitted increasing physical separation of activities and the outwards spread of urban areas at decreasing densities (Breheny 1992: 80).

Modifying settlement patterns to reduce energy requirements has often been suggested as one of the longer-term options for energy conservation. Susan Owen describes the energy-saving potential of efficient spatial structures, their planning implications and their physical and social constraints. Energy use within a society and its structuring of the built environment are closely interrelated, although the relationship is one in which cause and effect are not always easily distinguished.

The abundance of energy-providing resources, the level of technology required for their conversion into useful power, and various geographical and political factors determine the

cost and availability of energy. These in turn influences the shape and size of settlements, the density of development, the nature of communications systems and the degree of different land uses.

Until the early 1970s, the real price of fuel had been falling for about 150 years and the 1950s and 1960s saw an era of particularly cheap and abundant energy for the western world (Breheny 1992). This resulted in the development of a highly energy-intensive economic system, which became increasingly dependent on imported oil. In the built environment, the profligate use of energy manifests itself in decreasing densities and increasing physical separation of activities.

The resulting urban sprawl is probably at its most pronounced in North America but in Europe, too, planning and development proceeded with little or no regard for energy-efficiency; this is equally true of individual buildings, new neighbourhoods, towns and transport systems. Low-density suburbs demand a high level of mobility for the journey to work and other services. Furthermore, these development patterns considerably reduce the potential for any future adaptation to total energy system, which could greatly improve the efficiency of energy utilisation.

It has been found, for example, that large, sprawling settlements (especially circular ones) were inefficient in their use of energy for transport and that 'cluster' of smaller settlements would be better. Another common conclusion is that the physical separation of activities should be reduced in the interest of energy conservation. This could be achieved by increasing densities or by increasing the variety of land use.

Thus, a picture begins to emerge of an energy efficient settlement pattern consisting of small, relatively compact settlement 'clusters' within which residential areas of medium to high density would be planned around decentralised clusters of employment and service opportunities.

Low-density urban sprawl, for example, generates a greater need to travel than more compact structures of mixed land uses in which the physical separation of activities is small. The technical and economic viability of certain energy technologies and transport systems are affected by factors such as urban density and the location and mixing of different kinds of land-use. Interaction between energy systems and urban structures takes places at all levels from that of the individual building to the region.

1.12-Energy, Transport and Urban Form

Rapid growth in car ownership has permitted more dispersed patterns of urban development. These land-use patterns in turn require longer journeys for most daily activities. The problems associated with high urban car usage have led to widespread calls, from the European Commission amongst others, to alter the balance of passenger movement away from private and towards public transport.

Policies for sustainable urban development should therefore include measures to reduce the need for movement and to provide favourable conditions for energy-efficient and environmentally friendly forms of transport. Land-use planning has a key role to play in the attainment of these objectives (Breheny 1992: 88).

1.13-Reducing the Need for Movement

Figure 1.7 Pedestrian and cycling.
(Source: Roseland, M 1992: 36)

Some land-use patterns are potentially efficient in the sense that they reduce the need for travel (Breheny 1992: 88). At the urban level the most important factor is the physical separation of activities. Modifying land-use patterns will not guarantee transport-energy saving, though the smaller the physical separation, the lower travel needs are likely to be, and the more feasible it is to meet them by the most environmentally friendly transport modes, walking and cycling (Breheny 1992: 88). One way to reduce travel needs would be to bring homes, jobs and services together in a relatively compact urban centre to achieve a high level of accessibility with little need for movement. Many studies suggest that the concentration of development is an energy-efficient form (Ibid: 89). An alternative way to reduce the physical separation of activities is to decentralise some jobs and services and relate them to residential areas.

1.14-Promoting Public Transport

Figure 1.8 Promoting public transport.
(Source: LIoyd, J 1996: 31)

The above discussion has been concerned mainly with the way in which land-use patterns can influence the need for travel. But the location and form of urban development also affect choice of mode of transport, and therefore the energy and environmental implications.

The interactions between land-use, travel needs, and mode of transport need to be recognised and incorporated into an integrated system of land-use and transport planning for urban areas within their regional context (Breheny 1992: 91). This means that land-use planning must be sensitive to the requirements of public transport. Rail and bus systems are generally more energy efficient than cars (Breheny1992: 91), and less environmentally damaging. A bus travelling in uncongested road conditions uses least energy per passenger-kilometre, and a car used for commuting in an urban area the most; rail systems occupy a position somewhere in between. The most energy-efficient forms of travel are cycling, walking, buses rail and then the car (Haughton 1994: 98).

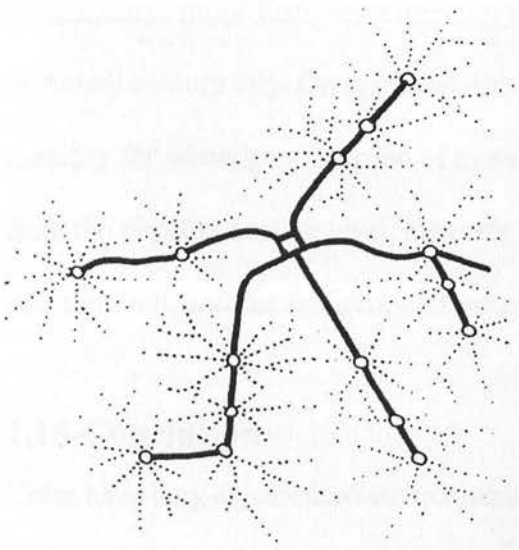


Figure 1.9 Bus routes. (Source: LIoyd, J 1996: 28)

In the Netherlands, it has been found that proximity of employment to public transport nodes is effective in discouraging car use for the journey to work (Breheny 1992: 91). Linking urban form and energy use, Sue Owens notes that:

- Interspersion of activities can change trip requirements, especially length, bringing energy demand variations of up to 130%;
- The shape of the urban area can lead to variation in energy demand of 20%;
- Density or clustering of trip destinations can bring about energy saving of 20%, mainly by facilitating public transport;
- Dense or mixed-use zones, facilitating combined heat and power systems, can increase the efficiency of primary energy use by 100%;
- Siting, landscaping, layout and materials can produce energy saving of up to 5%

through modifying microclimates.

In summary, more than any other single development, the motor car has reshaped the twentieth century city. On one level, this has been beneficial, allowing greater individual mobility for some, greater speed of movement of people and goods, and growth outwards from the city. On another level, the costs have been enormous, in terms of pollution, space consumption, and the separation of urban functions.

1.15-Conclusion

Cities have long experienced environmental problems, not least in respect of overcrowding, air, water and noise pollution, sprawl and poor housing. Such long-recognised problems persist in virtually all cities, but they are also being added to, as it becomes apparent that urban problems are intimately tied up with concerns over global environmental sustainability.

Sustainable development is about maintaining and enhancing the quality of human, social and economic life and of the environment with the ultimate intention of living within the capacity of supporting eco-systems and the local resource base. Sustainable urban development must aim towards a city that is 'user friendly' and resourceful, in terms not only of its form and energy efficiency but also its function, as a place of living. Such goals refer to protection against the destruction of the natural environment, a main cause of which can be seen to be urban sprawl. Excessive increases in urban size are often accompanied by increases in transport distances and therefore increase in car emissions.

Reducing pollution, promoting healthy living and maintaining the natural environment for all to enjoy, significantly improve the quality of our lives. Social goals that strive to achieve sustainable city life should also seek to enhance social life, social cohesion, a sense of

community and citizenship, and interaction, as well as promoting lifestyles that do not alter our environment. Social cohesion, exchange of information and social interaction as main objectives need to be combined into a recognition of an holistic person society environment system in order to nurture a truly sustainable urban environment.

Many of the arguments addressed in the literature on sustainability present sets of recommendations that predominantly address objective criteria. The author believes that, in order to achieve those goals, it is necessary to emphasise people's interpretations and evaluations of their environments because people are an intrinsic part of the whole system and interact with it. The next part investigates the transactional approach as a way of understanding the transaction between people and their environment. From this general understanding the researcher focuses on how people experience their urban environment.

Chapter 2

Transactional Approach

CHAPTER 2

TRANSACTIONAL APPROACH

2.1-Introduction

In the previous chapters the author has explained sustainability in relation to the built environment which is addressed from the physical point of view and mainly deals with infrastructure. The author believes that people and their relationships with their urban environment are systems that can not be dissociated into separated phenomena. People and their physical surrounding, in interacting between each other, form a single system.

The aim of this section is to contribute towards developing a deeper understanding of urban systems within a transactional approach.

2.2-Transactional Approach

The transactional approach assumes inseparability of contexts, temporal factors and physical phenomena. It treats context, time and process as aspects of an integrated unity and emphasises activity and process. A fundamental postulate of the transactional perspective, is the unity of the organism and the environment, thus refuting any models that deal with separate elements of a system; the transactional approach deals with them as a whole. People, process and environments are perceived as aspects of a whole, not as independent components that collectively combine to make up a whole (Altman, I. & Rogoff, B, 1987).

Transactional perspectives address ongoing, changing processes within the environment. This issue has been a principal concern in recent urban research models,

as cities never stay in a static mode. Within cities, these inherent changes may be embodied in functional transformations within the structure of the city (Nabih, H 1999).

The transactional perspective, within human-environment systems, claims that various aspects of the system serve to define each other. Transaction draws its motivation from an ongoing process of differentiation and evaluation of the environment, which is an integral to the development of cultures and has led to the creation of conditions that challenge our biological adaptation. Temporal qualities are considered as inherent aspects of phenomena and embody the flow dynamics of peoples' relations to social and physical settings. Research within this stream of thought draws attention to change, transition and shifts in life circumstances (Ibid.).

2.2.1-The contextual perspective

During the 1970's and early 1980's, a growing interest in contextualism occurred within several areas of research. Contextualism is rather similar in many respects to transaction, this orientation described by Dewey and Bentley in the assumption that contextual and temporal processes are fundamental aspects of phenomena. Contextualists do not emphasise universal or teleological principles that govern the phenomena. Instead contextualism attempts to predict change in relationships between variables depending upon the presence or absence of certain situational factors. The contextual theory goes on to explain why the hypothesised cross-situational variations in the target phenomenon occur, whereas non-contextual theories do not attempt to predict or explain cross-situational variations whilst drawing relationships among target variables (Altman, I. & Rogoff, B, 1987).

2.2.2-Transactional research

Transactional research attempts to holistically cover 'surrounding' phenomena that may have an effect upon a certain topic of study. Changes occurring within economic and political movements, geographic and ideological changes and other issues may collectively affect processes. As Altman, (1992) states;

> "*Much research and theorising is being conducted within a perspective that ignores and is detached from these socio-political-geographic events and changes*" (Altman 1992: 271).

Therefore transactional research is of a more holistic nature, in attempting to define embedded, complex changing social and physical contexts, which may influence change. If these 'contexts' were ignored, the studied phenomena would limit our understanding of the subject of study.

Attributes of change also exist within a transactional perspective. It stresses that it is necessary to describe the flow of dynamic events. Thus the personal qualities or cognitive structures of actors taken alone is of less interest than the dynamic transactions between people and with the environment.

The transactional perspective considers the position and role of the observer to be an aspect of the phenomenon. Different observers may provide varying but equally accurate descriptions of the same phenomenon, depending on their locations, roles and viewpoints. The transactional perspective advocates the study of how the observers may have studied and interpreted the events. This direction, rather than assuming reliability among the observers, attempts to indicate closeness to a shared truth that lies between

all viewpoints and not exclusively to one. This may also require an investigation about the characteristics and orientation of the observer.

2.3-Overview of the Transactional Perspective

The transactional perspective mainly describes the patterns of relationships among people and places. Altman et al. (1980) mention that change is a central feature of the transactional perspective where interaction is treated as a dynamic interplay of openness/closeness to others, and with particular levels of openness and closeness varying from circumstance to circumstance.

The author proposes the example of the study of billiards as a given set of phenomena. From a self-action stance, attempts will be made in understanding each independent billiard ball as an isolated phenomenon. Therefore the billiard ball, or phenomenon, is studied from a perspective that deals with intrinsic qualities devoid from any external forces. This suggestion can only be considered as long as that billiard ball remains in a static position. The transactional perspective considers that all the billiard balls are in constant interaction and movement. The transactional perspective acknowledges that the billiards have their own characteristics. Here the interaction between the billiard balls are not considered as isolated situations, but as the changing situations of various interactions. This therefore does not undermine the interaction between them but goes further in attempting to understand the ongoing changes in situations and relations as a result of these interactions.

The ability to consider a larger variety of aspects configuring the whole picture of an event would thus derive a relatively clear picture of any phenomena.

2.4-Urban Systems within the Transactional Approach

Cities, towns, villages, neighbourhoods are interrelated entities; people are a constant part of these entities, interacting with their surroundings. The urban system includes people. People, processes and environments work as aspects of wholes, not as independent components that collectively combine to make up a whole.

Urban systems can be seen from the transactional point of view as being holistic systems that include people's preferences and values. The author addresses the urban systems from this point of view.

The notion that urban complexes are indeed systems is far reaching and brings into question the conventional understanding of urban problems and solutions (Lozano 1990). Often, apparent problems are really *syndromes of underlying disease mechanisms*. Without a systematic understanding of them and their interrelationships, *solution* themselves have unintended, unforeseen and sometimes disastrous consequences. The following section will introduce the concept of system in an urban context.

2.5-Transactional Approach and Systems

A fundamental postulate of the transactional perspective is the unity of the organism and the environment. Thus refutes the model dealing with separate elements of a system and instead deals with them as a whole.

The concept of systems originated from before the Second World War in the field of communications but was developed in earnest in military applications during the 1940s and especially the 1950s. It eventually expanded into the new fields of systems engineering, systems analysis, systems theory, information theory, operations research,

management systems and mathematical modelling, which applied interdisciplinary knowledge from other branches of science to the solving of complex problems. These fields have attracted scientists and scholars from a variety of disciplines; among those relevant to our concerns is Ludwig von Bertalanffy biologist and originator of General Systems Theory (Lozano 1990).

A system can be defined as "*a group of parts whose interaction facilitates the performance of the parts into an organised whole with characteristic overall responses*" or as "*a set of interrelated worlds and activities linked together to accomplish a desired end*" (Lozano 1990: 74). Basic to the notion of systems are the concept of interrelationship and interaction, which tie together a particular universe for a purpose.

In many instances, urban problems are a manifestation of partial disruption in the system that demands a 'repair' solution to bring the system back to its original state. In other instances, urban problems may be symptoms of increasing incoherence within the system of an organisation that is no longer able to satisfy emergent goals because they are in increasing conflict with the system. In those cases, a 'repair' solution would do no more than buy time, and the only way to bring about a viable new system would be to rearrange it structurally (Ibid.).

One of the essential characteristics of systems, including urban systems, is that they have their own internal corrective mechanisms that trigger processes aimed at solving their problems. The behaviour of most urban systems "*is governed by the dynamic structure of the systems*" (Lozano 1990: 76).

Lozano (1990) continues, saying that planners and designers must immerse themselves in the urban systems in order to understand them thoroughly, but the more they probe the system, the more complex it appears. Because of their increasing specialisation and size, contemporary cities are far more complex than they were a few decades ago.

He adds:

> "*The large metropolitan settlement is indeed the locus of a wide variety of activities and it does indeed comprise a more complex network of functional interdependencies than any one man can comprehend*" (Lozano 1990: 76).

The city planner must account for such factors as location in the metropolis, accessibility, land use mix and adjacencies, densities, open space, population, social trends, dwelling unit types and variations, site design and finally cost levels; these in turn, must be disaggregated and their interrelationships considered and evaluated.

Complexity originates in the 'richness' of a system, with the multiplicity of its parts individuals, families, groups, neighbourhoods, institutions, governments agencies, stores services and the high and highly differentiated level of interaction between the parts. It is defined by the number of possible connections between component different parts of the system. The level of interaction is related to the level of development of the urban area.

Lozano (1990) defines hierarchy as the basic structural order of complex systems with pervasive and universal laws of organisation. As Herbert Simon states, "*complexity frequently takes the form of hierarchy, and hierarchic systems have some common properties that are independent of their specific context. Hierarchy is one of the central structural schemes that the architect of complexity uses*" (quoted in Lozano 1990: 85).

Lozano adds that: "*hierarchies permeate most of our universe, including cities, urban complexes, and buildings, as well as socio-economic organisations and urban sectors such as education and health. Hierarchies provide a conceptual framework for probing, and dealing with the complexity of an urban system, because they organise its constituent subsystems into a totality. Hence, hierarchies allow us to prioritise subsystems without missing the totality*" (Lozano 1990: 85).

Urban hierarchies are spatial systems with distinguishable levels. Each level is related to at least one other level, with a unit at the next (smaller) level. Levels are identifiable subsets composed of parts characterised by the same status, that is, similarly related to other levels. Each level of a hierarchy is connected by asymmetrical relationships to other levels. Parts and levels are organised directionally in specific ways: each one influences some other component and is influenced, in turn, by yet another component; each one is subordinated to some component, but subordinates yet another. Examples of 'directed' relationships abound: basic employment influences the location of retail uses, which influences the location of retail uses, which influences the location of more residential use and so on.

The notion of hierarchy helps us to see urban elements from different angles. For example, a commercial centre can be considered as a component of the metropolitan retail subsystem of stores and shops. It is at the same time a unit competing with other units, an aggregate formed by individual stores and a part of the retail sector of the city; it is a service centre to area residents, a business for its owners, a workplace for its employees, a buyer for wholesale distributors, a real estate investment, part of the city tax base, a factor affecting surrounding property values, a place to which people travel, a cause of congestion and possible public investments in streets, highways, and mass

transit, and a place for social encounter. Lancelot Law Whyte stated "*the whole is more than the sum of the parts*" as "the system is different from the mere aggregation of the parts", since each part "*may possess... different properties when several of them are arranged in an ordered system by asymmetrical relations*" (quoted in Lozano 1990).

Understanding urban areas as hierarchical systems allows the researcher to select the minimum whole most suited for study, by choosing or discarding other levels, parts and relationships based on their relative impact on the problem area. Hierarchy is truly the *grammar* of urban order (Lozano 1990).

2.6-Conclusion

In order to provide a better understanding of the issue of sustaining the urban environment through people's perception it was necessary to introduce the transactional approach, which recognises people as being an intrinsic part of the whole system that interacts with the urban environment. The transaction approach assumes the inseparability of contexts, temporal factors and physical phenomena. The transactional perspective mainly seeks out, describes and analyses patterns of relationships among people and places; it treats people's transactions within the environment as holistic entities and part of urban systems.

In order to gain better understanding of the issue of sustaining the urban systems, the next part of this research investigates how perceptions of the environment are generated within individuals and are guided by cultural and social pressures as much as by the 'raw facts' of their surroundings. From this general understanding the researcher focuses on how people experience their urban environment.

Chapter 3

Environmental Perception and Cognition

CHAPTER 3

ENVIRONMENTAL PERCEPTION AND COGNITION

3.1-Introduction

In the previous chapter the author of the research has introduced the transactional approach, which recognise people and their relationships with their urban environment as systems that can not be dissociated. The author of the research considers people's perception, experiences important part of the whole system.

The author is anxious to address perception in this part. Many researchers on sustainability focus on objectives without considering the importance of people's perception of the urban environment. The lack of conceptual framework for evaluation and analysis is a weakness for most research when dealing with people and their physical environments.

In environmental research, confusion often happens in discussion of the word 'environment' on the grounds of its varied meanings. Some analysts distinguish between the personal (behavioural and experimental), phenomenal (physical and human) and contextual environment. Others are more concerned with the physical, the social, the psychological, and the behavioural environment. In view of such diverse and complex alternatives in environmental research, this chapter discusses perception of the environment, in which it will define the build environment, cognition and environmental evaluation.

Environmental perception involves the ever-present stimuli of contextual information as well as stored stimuli emerging from the interaction between each physical stimulus and the perceiver's current and stable ambitions, fears, values, and various other real and imagined elements. An understanding of this is central to the main objective of the thesis which is to explore people's relationship with the built environment. The study of meaning enables the author to identify and examine many parameters involved in people's evaluation.

As is widely recognised in research on environmental perception and cognition, the environment must somehow be represented within the individual's perception, thinking and memory. The problem of the way environment is represented is the problem of revealing a perceptual/ cognitive structure, defined as patterns of organisation in the individual's representation. As noted by Craik, taking perceptual/ cognitive structures into account is indispensable if we are ever to achieve the predictive power over behaviour in physical and social settings so badly needed by environmental and planning disciplines (Assi 1998).

In its broadest sense, the term 'perceptual/cognitive structure' applies to representations of different type of knowledge but for the present, its use is confined to the classification and coding of the physical environment. Though some researchers, employing the semantic differential technique developed for the measurement of meaning, have assumed that the individual attends to and represents the environment in terms of dimensions or qualities.

3.2-The Built Environment

The concept of the built environment comprises many factors. Many of these factors interact. In some cases they may have a cumulative effect, so that the relative responsibility

of different factors is difficult to disentangle. Even if this were possible, the exercise might prove futile when it is the total improvement of the built environment that should be the aim and not that of one or another particular aspect (Kaki,W 2000).

The urban environment comprises physical factors such as standards of housing, domestic overcrowding, density of population and atmospheric pollution. These are relatively simple to assess and are discernible by some form of measurement. But 'environment' also includes the services available such as educational, recreational and health facilities. The effect of these on the inhabitants depends partly on their ability to make use of them and this in turn is conditioned by the cultural and educational background. These factors may impose a lag between achieving physical improvements in the environment and its meaning to the inhabitants (Ibid).

The notion of meaning of the built environment is an essential aspect of self-awareness. Throughout history, the meaning of the environment has been of extreme significance in man's response to satisfy human needs. Mankind creates objects as an attempt to stress his significant existence through which he could express his beliefs, attitudes and values (Ibid).

Much of what has been written about the environment in recent years has understandably stressed what is wrong. Some critics have gone so far as to allege that these problems are the result of a market- led agenda in which those responsible for environmental planning are deeply implicated. There are undoubtedly weaknesses in their understanding of the problems they face and in the machinery for making decisions, but constraints of cost and of existing investment in the urban fabric cannot be wished away. It would be more productive to adopt a positive approach, recognising the great improvements that have been

made in the internal environment of buildings since the Second World War and considering how an external urban environment to match real needs can be achieved. As with the problem of derelict land, the technology that creates many of the most pressing environmental problems is also capable of contributing to their solution.

One of the great difficulties frequently encountered in the design of the built environment is lack of comprehensive knowledge. It seems that architecture tends to concentrate its attention on individual buildings, while a substantial amount of planning effort has been turned away from three-dimensional planning and towards strategic issues, zoning and management. The result is that there are now few people who are both able and willing to give their undivided attention to a great number of minor projects which individually are of little consequence, but collectively create environmental chaos.

3.2.1- The meaning of the built environment

People live, work, play, act and do things in touch with the world surrounding them, natural and man-made, which is known as the 'physical environment'. Schulz wrote that: '*the concrete world for the environment is place. It is common usage to say that acts and occurrences take place. It is meaningless to imagine any happening without reference to a locality. Place is evidently an integral part of existence'* (Schulz 1984 As quoted in Abdalla, M 1998: 251).

What do we mean by the term 'built environment'? This term means something more than the abstract location of the random assemblage of people and things. It means the totality made up of a pattern that is organised in a certain form (Abdalla, M 1998). Spatial-objects and people are related through various degrees of separation in and by space. When the

environment is being built, it means space is being organised and structured in a way that reflects certain rules or ideas. However, space is the three dimensional extension of the world around us, the intervals, distances and relationships between people and people, people and things, and things and things. Space organisation is then the way in which these separations occur and is central in understanding, analysing, and comparing built environment (Ibid).

In the built environment it appears that people react to their surroundings in terms of what meanings they have for them, in other words, it is a matter of latent rather than of manifest function. It can be said here that people deal with and react to their environments globally and effectively, even before they analyse and evaluate them in more definite terms. Therefore the universal concept of environmental quality is, in fact, an aspect of this. People prefer certain places in the urban areas, or such building forms, because of what they mean to them. For instance, some people like places with a rural character where there is greenery, quietness and healthy air, while places considered to be industrial, smoky, noisy and dirty, may be disliked (Ibid). Thus trees may be highly valued not least because they indicate high-quality areas and evoke rural associations. Although, physical objects evoke feelings in us, they provide a background for more specific images, which are then fitted to the objects, these meanings are somehow a result of people's interaction with their environment.

3.2.2-Importance of meaning

According to Rapoport, environments are thought before they are built. Man shapes his environment and afterwards his environment shapes him. It is a dynamic relationship mediated by meaning. People appear to give their environment meanings, and then they behave according to those meanings (Ibid).

Man tends toward a mode of comprehension which provides an initial metaphysical interpretation of life, an interpretation that goes beyond all external perception. This initial interpretation affects most of his perceptions, but begins by locating him to the universe. Because within structured space man knows where he is, direction is meaningful to him. Originally this interpretation defines his awareness of cosmic space as an externalisation of the macrocosmic creation which is similar to his own microcosmic self. Ancient people see the universe as composed of a microcosm and macrocosm, each of which includes three categories: body, soul and spirit (Ibid).

Space and place are well connected, because the concept of 'place' is composed of both the 'body' and the 'spirit'. Place does not have a tangible existence, but exists in the man's consciousness. Man perceives the physical borders visually while his mind perceives the defined spirit within these borders. However, man needs to locate himself in space within the city. This need thus creates the location and the relation between building masses which we call urban structure (Ibid).

In the built environment, each society develops a set of shared meanings held in common by its members. Architecture as a human product often carries symbols and meanings by which it appears to reflect the society's culture and identity. People translate these

meanings and illustrate them in a visible way, in the form of signs, shapes, and colours..Etc, to evoke these meanings in the viewer. This interpretation states: 'Architecture is the visual aspect of history', that is the way in which history appears. Such an interpretation can be given on the level of both social and cultural conceptions (Ibid).

3.2.3-The social meaning

The relationships between societies and their built environments have been considered in terms of the meanings attributed to buildings. Many authors and writers criticise deterministic interpretations of the relations between people and buildings which attribute the role of an independent variable to physical features: some writers, including King and Dunleavy, declare that we have to consider the social production of the built environment, whereas other authors examine the multivariate meanings attributed to buildings (e.g. Rapoport, Krampen). These references illustrate the need for a comprehensive and coherent analysis of the meaning of the built environment (Abdalla, M 1998).

For many people the house is synonymous with the home. It may be thought of as a purely functional domain: a 'machine for living' in Le Corbusier's words. Socially the house is the meaning of life and its place: the location of birth, death, success, failure, poverty and prosperity. A house is not just a building framework which gives protection against climates and provides a place for relaxation. A house is much more than that. It represents generosity, dignity, nobility and all the habits associated with a good life.

Knox (1984) notes that the built environment can facilitate, inhibit, encourage or modify individual and group behaviour, his approach included the reciprocal and repetitive relationships between individuals, society at large and the built environment.

3.3-Cognition

In the last half decade a new field of cognitive psychology has come into being. It studies perception, memory, psychology of language, cognitive development and many other problems that had lain dormant for half a century (Abdala, M 1998). To cope with the world, the mind must gather information and must process it. Gathering information is related to perception, whereas processing is related to cognition. However, cognition is not limited to processing; it also consists of intelligence and problem solving which include understanding, reasoning, judging, etc. As Neisser explains, '*cognition is the activity of knowing: the acquisition, organisation and the use of knowledge*' (Neisser 1976 as quoted in Abdalla, 1998: 307).

Fravell suggests that although it is important to communicate ideas about the nature of cognition, it is neither possible nor desirable to define it and limit its meaning in any precise or inflexible fashion. He states that the traditional image of cognition tends to restrict it to the 'intelligent' process and products of the human mind. This image, he added, includes such higher-mental-process types of psychological entities as knowledge, consciousness, intelligence, thinking, imagining, creating, generating plans and strategies, reasoning, inferring, problem solving, conceptualising, classifying and relating, symbolising, and perhaps fantasising and dreaming (Abdala, M 1998).

What one knows and thinks (cognitive) obviously interacts in a very substantial and significant way with how one feels (emotion). If there is no no-arbitrary place to stop once we go beyond a narrow, purely higher-mental-process image of cognition, why go beyond it at all? Flavell asked this question and his answer was that the processes which go into

'thinking', 'perceiving', 'remembering' and the rest are in fact interwoven with one another in a complex way. Each process is believed to play a vital role in the operation and development of every other process, affecting it and being affected by it. What you know, for example, affects and is affected by how you perceive; how you conceptualise or classify things influences the way you reason about them, and vice versa.

Piaget on the other hand, views human cognition as a specific form of biological adaptation of complex organism to complex environment. The cognitive system he envisaged is an extremely active one. That is, it actively selects and interprets environmental information in the construction of its own knowledge rather than passively copying the information just as it is presented to the senses. While paying attention to the structure of the environment during knowledge seeking, the mind always reconstructs and reinterprets the environment to make it fit in with its own existing mental framework. The mind builds its knowledge structures by taking external data and interpreting it, transferring it, and recognising it. However, Piaget made much of the idea that the mind meets the environment in an extremely active, self-directed way (Assi 1998).

The Piaget model describes how this cognitive system interacts with its environment, and, by means of many such interactions, undergoes developmental change. According to this model, the cognitive system plays a very active role in its cognitive interchanges with the numerous experiences in its milieu, rather than simply making a mental copy of what is experienced. Each cognitive encounter with the world always has two aspects, assimilation and accommodation. Assimilation essentially means interpreting or constructing external data in terms of the individual's existing cognitive system. What is encountered is cognitively transformed to fit what the system knows and how it thinks (Ibid).

The key elements of cognition are cognitive maps and perceptual schemata, which essentially constitute both the framework for and the content of our memory, operating on cognition and perceptual levels, though on a large scale, accepting information and guiding exploration. Culture has an important role in terms of building the cognitive structure. Culture, including social actions, informs us about ourselves as well as about the world with which we are engaged. It too, creates cognitive structures that have many other uses. In other words, fundamental cultural knowledge by which people interpret and evaluate the world is embedded in the individual cognitive structure of people (Ibid).

3.3.1-Cognition and schemata

People's understanding and remembrance of events is shaped by their expectations, which are obtained through a series of experiments. The most commonly used constructs to account for complex knowledge organisation is schema. So a 'schema' is a structured cluster of concepts; usually, it involves generic knowledge and may be used to represent events, sequences of events, precepts, situations, relations, and even objects (Assi 1998).

Jencks thinks that the way people perceive the world depends on the concepts that they already have (schemata). These schemata are not based on intrinsic information, but are the result of a gradual process of gathering information and gaining experience, and through cultural symbols. The schemata determine perception. People are not passive receptors of outside stimuli, they perceive things according to a former expectation mostly found over time, but the initial necessity before an individual gets involved with the built environment is first to understand it. Schematic knowledge itself is the consequence of long term experimental interrelation between the individual and the environment and includes information about expectations, values, norms, and so on.

As Grynberg argues:

'Reference is linked to the subject's knowledge systems, semantic networks, systems of categorisation, habit, and so forth, all of which vary between individuals and between cultures' (Grynberg 1991 as quoted in Assi 1998: 20).

The concept of 'schemata' is related to one of the most significant theories about the human mind identifying the people- environment interconnection. Eysenck, referring to Kant's philosophy, proposes the idea of schemata as innate structures for organising our perception of the world. Bartles showed that the schemata vary with culture and things are remembered not in order of presentation but how they are assembled into schemata. In other words, schemata help to make the world a more predictable place than it would otherwise be (Assi 1998).

Schemata form that portion of the entire perceptual cycle which is internal to the perceiver, modifiable by experience, and somehow specific to what is being perceived. Schemata accept information as it becomes available at sensory surfaces and are changed by the information; they direct movements and exploratory activities that make more information available, by which they are further modified (Neisser, 1976). The user constructs cognitive schemata that have a predictive value because schemata are induced or abstracted from many specific experiences. Rapoport (1977) argues that: If something has to be transmitted and learnt in human terms it should have cognitive and schematic basis.

There is enough evidence to show that culture is the main resource for human schemata. This explains the relative sameness of actions and reactions among a group of people who are under the umbrella of the same culture and why in a cultural context entire systems of

behaviour that are made up of hundreds of thousands of details are passed from one generation to the next.

The relationship between culture and schemata is tied into the whole cultural structure, although the details inside a culture's structure may differ from one person to the other, or be forgotten or ignored. Neisser (1976) argues that the forgetting tends to affect minor details of embedded schemata rather than the overall embedding structure. The total meaning of a sentence or a story survives far longer than the particular words that first established and expressed it. The structured knowledge that identifies fundamental interaction between people and their relationship with nature, ideology, and the society, for instance, cannot be changed as quickly as their ideas about, say, clothes fashions or car technology, because they are the basis of people-environment unity.

Culture, therefore, is to be found both in people's minds and in their surroundings. According to George Kelly's theory about the structure of the mind, as well as the theory of perception, cognition and schemata, individuals actively interpret the external world according to prestructured images and knowledge. Although it can be claimed that some of this knowledge is shared among almost all people all over the world, as stereotype images, each person's perception is for the most part affected by local culture and its verbal symbols, producing differentiation and bonds of similarity between people in various societies and environments (Assi 1998).

Equally, it can be said that the external environment in different ways is already "culturised" in that it holds and manifests cultural verbal and non-verbal symbols. When children learn, they are learning to perceive and recognise their particular environment

through meanings and symbols. They are necessarily dealing with a culturally affected environment: therefore, as children develop, their mental structures, i.e. schemata, are strongly influenced by local culture and its related environment.

3.3.2-Cognition and the environment

Rapoport (1977) defines the term 'environment' as a series of relationships among elements and people. These relationships are orderly; they have a pattern. The environment therefore has a structure and is not a random assemblage of things. It both reflects and facilitates relations and transactions between people and the physical elements of the world. These relationships in the physical environment are primarily spatial, meaning that objects and people are fundamentally related through separation in and by space.

People's membership of families, group or institutions affects their role, the way in which they communicate and their ways of handling social networks, kinship systems, values and many other group characteristics. These influence the form of the built environment and are, in turn, affected by it. For instance, the house is both a feature made of physical/ environmental materials, and a largely socio-cultural fabrication. However, 'physical environment' is a term with several dimensions. It can be subdivided into 'natural environment' and 'built environment'. it includes the geographical features (topography) and the climatic conditions (temperature, wind, rain, etc.) and the results of people's alterations of environments, cities, communities, farms and houses (Rapoport, 1977).

Although people's preferences for places has only recently become a subject for research, and while much remains to be done, a number of people have thought about the images that individuals have of their local environments. Usually these environments are urban areas

and interest has focused on the way in which people perceive certain landmarks, routes, boundaries and neighbourhoods. One of the first people to comment upon such things was Charles Trowbrige, who noted that some people in a city always seem to have good sense of orientation, while others were usually subject to confusion when emerging from theatres, subways, etc. Some people, he thought, had informal, imaginary maps in their heads centred upon the locations of their homes. They were able to move around the urban landscape as long as they remained on familiar ground but quickly became disoriented in unfamiliar areas. Other appeared to be egocentric, and saw directions in relation to their own position at any given moment. These people seemed to be able to navigate much more surely (Assi 1998).

3.4-Perception

How do people acquire and process information about their environment? Obviously this happens through the various sensory modalities: vision, hearing, smell, touch, taste. According to Rapoport, before cues can be understood, they must be noticed; before the social significance of elements can be assessed, they must be perceived; before messages whether, signs, buildings, area or locations, can be evaluated, they must be kept separated from noise. Perception is then the most fundamental mechanism linking people to the environment. It is the most direct and immediate sensory experience of the environment (Ibid).

All our senses (optical, auditory, olfactory, tactile and taste) are means of obtaining information. They receive first hand information about the properties of the environment from the environment. There is some justification for concentrating on visual perception,

because vision is arguably the most acute. People can discriminate more between the signals through vision than through other senses. The amount of information carried by this channel is believed to be correspondingly high (Ibid).

Every organism lives out its days in relation to, and as part of, a larger environmental context through sense organs and processes, together with information from other sources, in the nervous system (Ittleson, 1973). The perception and processing of information from the environment constitute the area of study designated as perception.

Perception is commonly used in the sense of what is "seen" because the function of seeing is argued to play the essential role in gathering information. Most theories of perception have been constructed with a sense of sight in mind. According to Kitoni, the stimulus is first received by the sensory organs. Secondly it is transformed into neutral impulses and then carried through the nerves to an area of the brain called the cortex (Assi, 1998). This cites Smith's explanation that a person's body "*is equipped with a number of highly sensitive receptors which convert energy emitted by the environment into energy of a different nature which conforms to the structural code of the brain*" (Smith 1974 as quoted in Assi 1998: 15).

Arnheim argues: "*Without information on what is going on in time and space the brain cannot work. However, if the purely sensory reflections of the things and events of the outer world occupied the mind in their raw state the information would be of little help. The endless spectacle of ever-new particulars might stimulate but would not instruct us. Nothing we can learn about an individual thing is of use unless we find generality in the particular*" (Arnheim 1969 as quoted in Assi 1998: 16)

Evidently, then, the mind, in order to cope with the world, must fulfil two functions. It must gather information and it must process it. The two functions are nearly separate in theory, but in practice they are not.

Traditional thinkers, according to Arnheim, view perception and cognition as opponents, in need of each other but different from each other in principle. Thinking consists of intellectual operations performed on perceptual materials. The material becomes non-perceptual from the moment when thinking has transformed the raw prospect into concept. Arnheim criticises the last point by arguing that the "*operation called thinking is not the privilege of the mental process above and beyond perception but an essential ingredient of perception itself*" (Arnheim 1970 as quoted in Assi 1998: 16). For Arnheim there is no difference between what happens when a person looks at the world directly and when he/she sits with his eyes closed and "think" it is difficult to separate the cognitive and perceptual process in his work.

Looking at it from a different point of view, Rapoport (1977) proposes some differences between perception and cognition. These proposed differences correspond to that between direct (perception) and indirect perception (cognition).

Yet another view can be found in Neisser's work (1976), where he suggests that perception and cognition are both parts of one unique cycle. He assumes that cognition and the perceptual process are successive and affect each other, Whereas the function of an expected stimulus is to initiate the cycle of perception.

The different views on perception and cognition are complementary, in fact, as Neisser has concluded. Those who treat perception and cognition as two functions in need of each other are right; those who find them embedded are also right along with those who suggest that cognition and perception interact. "*Each of these views has focused on a single aspect of what is normally a continuous and cyclic activity*"(Neisser, 1976 as quoted in Assi 1998: 16).

Cognition is a broader term which includes perception. It is associated with the psychological process by which human beings obtain, store, use and operate upon information. It consists of sensing, perceiving, remembering, deciding and other types of psychological process and is intimately related to experience. Perception, by comparison, is a more specific term. It is the psychological function that enables the individual to collect sensory stimulation into organised and coherent experiences.

George Kelly defines perception as "*the process of interpreting stimuli in the environment. This involves classification of novel stimuli or novel combinations of stimuli, and the recognition of familiar stimuli, or sets of stimuli, where the interpretation of the input is now clearly with the process of recall*" (George as quoted in Assi 1998: 16). It is obvious from this definition that any new stimuli cannot be perceived or recognised unless they are compared with what is stored in one's memory and some kind of correlation is made. In other words, "no perception, and as a result no intelligent behaviour, can occur in any automation which is not able to store information from the past"(Assi 1998).

Levine and Shefner suggests that "perception refers to the way in which we interpret information gathered (and processed) by the senses". In a word, we sense the presence of a

stimulus, but we perceive what it is. This process of interpreting sensory information is complex and involves a considerable variety of processing mechanisms. At the very least, perception depends upon a basic physical system associated with each sensory modality, together with central brain processes that integrate and interpret the output from these physiological systems. Hence it is suggested that perception itself depend on the skill and experience of the perceiver, and on what he knows in advance (Ibid).

3.5-Perception and Evaluation of the Environment

A visitor enters a classroom for the first time, the layout and décor of which a colleague wishes him to admire. 'Are you aware of the special atmosphere of this room?' ask his guide. What does he reply? Does he describe the ventilation, the illumination, the academic activity, or the staff-student relationships, which should be encouraged in such a class? This distinction is very revealing. The same vocabulary can be used to describe the physical aspects of the environment and, in a way which is at the same time of greater significance and less precise, to define psychological characteristics as in the global evaluation of the environment made by the person in it, as well as his opinions about the effects which that environment should have on the behaviour of the people in it. Physical descriptions, aesthetic evaluations, personal preferences, predictions and expectation mix together and interact (Leboyer 1982). In addition, in perception as much in evaluation, our visitor has resource to his store of mental representation and cognitive schemas. He or she recognises what is seen by drawing upon cultural norms about what a classroom should be like. And that is not all. Both perception and evaluation of the place follow from the dynamics of the context. In reality, all modes of experience, perceptual, affective and normative are brought into action at the same time (Ibid).

3.6-Environmental Evaluation

Conversely, evaluation (aesthetic, affective, and the like) structures and modifies both perception and mental representation.

The perceptual mechanism is not the equivalent of a passive camera, which would give an image of greater or lesser quality, but physically exact and identical in every case. On the contrary, perception is an active process in which the whole individual is involved. In perceiving the environment, the perceiver constructs it and the result of the perceptual elaboration is individual to each person. It is therefore not possible to separate the perception from the individual who is perceiving. In order other words, environmental perception is not just a function of the information in the environment, which constitutes the sensory stimulus. It is just as much a function of the individual and his or her relation to that environment (Ibid).

There are three processes: the individual *sorts*, *judges* and *deciphers*. In fact, the information received is from a variety of sources and relates to all the sense organs. Cortical and infra-cortical processes filter that which is significant from that which is not. This significance is assessed as a function of individual attitudes, activities and needs of the person and, at the same time, of the situation in which he is. Incoming information from the environment and cognitive schema, which allow us to interpret it, are essential to adaptation and to the survival of man in the environment. From this point of view, perception cannot be understood except as an instance of human activity in the environment (Ibid).

3.7-From Perceiving to Evaluating the Environment

The relationship between perception and evaluation of the environment is very much a functional one (Leboyer1982). Kaplan clearly described the four levels of knowledge of his environment, which a person needs in order to be capable of surviving. First, one needs to know where he or she is, with some exactness, rapidly and error-free. Second, a person must be capable of predicting what is going to happen next that is, to connect the present representation with future ones. Third, prediction is not sufficient to make a decision. An evaluation must accompany it, made in relation to the value judgements of the individual. Action represents both the end of a process and the last phase of mental representation: it can just as easily be the object of internal representation as objects or events in the environment (Ibid).

It is well known that the record of concepts and abstract dimensions varies widely from one individual to another (Leboyer 1982: 71). This is also true of the environment. The number of cognitive dimensions available to an individual for the evaluation of his environment that is, his ability to discriminate different aspects is a representation of a personality characteristic.

It has been shown that cognitive complexity is correlated with overall satisfaction with the environment. It is perhaps the case that there is no such general need for an imageable, legible environment, but for an environment the complexity of which corresponds to the individual capacity to collect information and process it (Leboyer 1982: 69).

It is not possible to examine separately the problem of what is perceived from that of what gives rise to satisfaction. In reality, it is necessary to approach this double question at different levels. The first level is conceptual: how are the qualities of the environment perceived? Clearly, this problem is not only a cognitive one. It is one thing to say that this room is large or bright, this wall is yellow or dirty, and quite another to feel impressions of happiness, privacy, or safety, which are produced by just those rooms, walls, or colours. It would be therefore be useful to add psychological concepts (comfortable, welcoming, private) to the concrete characteristics based in the physical sciences and used to describe environments (large, quiet, bright), and to investigate between the relations between them (Ibid).

3.8-Satisfaction and the Environment

A problem which can be raised on the topic of environmental evaluation is more directly related to the quality of the environment: What determines individuals satisfaction with their environment? Do specific satisfactions exist or is there a universal satisfaction? Do specific satisfactions and dissatisfactions interact? It would be impossible to cite here every survey, which has been carried out, but the more revealing problems can be discussed. Some studies have been restricted to producing a list of the facilities for users and an evaluation of their success in satisfying those users (Leboyer 1982).

The built environment presents the same sort of problems and should produce the same sorts of studies, but with two specific characteristics. On the one hand, a building has numerous purposes, some of which may be contradictory (for instance quiet and proximity to transport). On the other, the growth of cities, producing megalopolises, frequently

unplanned and undisciplined, has more often produced nuisance than satisfaction. It is this, perhaps, which explains the fact that the majority of studies concern specific aspects of the environment, even furniture. These fragmentary studies bear only upon the specific conditions under which they were carried out, since every environmental factor is only evaluated in relation the others. It is exactly this network of interaction which we need to understand in a precise way (Ibid).

3.9-Conclusion

An understanding of people's perception and evaluation of their urban environment is central to achieving the main objective of the thesis, which will contribute (deals with the problems stated on the introduction) for a sustainable urban environment through exploring people's relationship with their built environment.

As is widely recognised in research on environmental perception and cognition, the environment must be somehow represented within the individual's perception, thinking and memory.

Chapter 3 has discusses the meaning of the urban environment and explains how the notion of meaning is an essential aspect of self-awareness. People live, work, play, act and do things in touch with the world surrounding them, natural and man-made, the 'physical environment'.

Man shapes his environment and his environment reciprocally shapes him and becomes one of the forces shaping his cognition. Chapter 3 also discusses various theoretical approaches

to cognition, particularly Piaget's model which describes how the cognitive system interacts with its environment and, by means of many such interactions, undergoes developmental change. In other words, fundamental cultural knowledge by which people interpret and evaluate the world is embedded in the cognitive structure of people.

In this chapter the term 'environment' comes to be defined as a series of relationships between elements and people. The environment therefore has a structure and is not a random assemblage of things. It both reflects and facilitates relations and transactions between people and the physical elements of the world. These relationships in the physical environment are primarily spatial, meaning that objects and people are fundamentally related through separation in and by space.

Perception is an active process in which the whole individual is involved. In perceiving the environment, the perceiver constructs it and the result of the perceptual elaboration is individual to each person. In other words, environmental perception is not just a function of the information in the environment which constitutes the sensory stimulus. Incoming information from the environment and cognitive schema which allow people to interpret it, are all essential to adaptation and to the future of man in the environment. From this point of view, perception cannot be understood except as an instance of human activity in the environment. The relationship between perception and evaluation of the environment is very much a functional one.

Every perceptual identification, every system of attitudes toward the environment, is based upon representations and norms which are acquired by people as a result of individual and

cultural experiences. Studies of perceptual development show clearly how systems of mental representations of the environment are built up to allow both the integration of perceptual information and its uses as rich and meaningful signs. The environment contains values which are either desired or not desired. Past experiences play a triple role in environmental perception and evaluation. The meaning of the built environment is essential to help one to understand people's interpretations of the place they are living in.

Chapter 1 began by introducing firstly the notion of sustainability as it is related to the built environment, after which it became necessary to address the transactional approach to see how people interact with their environment and are part of the whole system with cognition and perception forming a mechanism of experiencing and interpreting the built environment. In the next chapter, the researcher introduces the cities where the case studies have taken place. It describes separately the two settings in term of their urban development related to urban growth from the point of view of sustainability.

Part Two

Case Studies

Chapter 4

Edinburgh and Ottawa

CHAPTER 4

EDINBURGH AND OTTAWA

4.1- Introduction

Any case study could have been used as a tool to explore people's interpretation and evaluation of their urban environment. The familiarity of the author of this research with Edinburgh and Ottawa gave him the possibility to explore the cities with their differences and similarities. This section is dedicated to the case study application, the purpose of which is to introduce the two settings where the studies have taken place. One is European (Edinburgh) and other one is North American (Ottawa).

This chapter describes each city separately, their urban developments and changes. The first part of the chapter introduces the city of Edinburgh and the second part of the chapter describes the city of Ottawa.

4.2-Historical Background of Edinburgh

Figure 4.1 Edinburgh castle and its natural site (The author 00).

Edinburgh has benefited tremendously from its natural site, which has made it acknowledged as one of the most beautiful cities in the UK if not in Europe. The shape of the city and its style are characterised by adaptation to the physical and visual strength of its site, topography so individual that it has never ceased to dominate in spite of the changing urban

forms and materials of the city up to the present day. In the Old Town the High Street is the major feature and route in the city's structure running from west to east situated between two important nodes and landmarks. At its west point, the Castle, standing on a high supportive of rock, overlooks the surrounding countryside (see **Fig 4.1**). On the east the former Holyrood Abbey and the more recent Holyrood Royal Palace lies in-between central Edinburgh's other two hills Arthur's Seat and Calton hill (Youngston, A 1966).

Figure 4.2 Plan of the city of Edinburgh. (Source Youngston, A 1966)

The location of the castle rock is clearly the most defensible place within the city. The only nearby site for development was the long ridge descending to the east. Down it, from the castle to Holyrood, runs the long street known from the sixteenth century as the Royal Mile. By the seventeenth century and early eighteenth century the historical image of the city was the densely built-up spur of the rock, with the castle at its head and the palace at its foot. Major expansion did not take place until the mid eighteenth century, piecemeal to the south but regular on the level ridge of the town's land to the North, made accessible by draining and bridging the north Loch (Ibid).

4.3-City of United Character

Figure 4.3 Edinburgh's buildings match the topography (The author 00).

"*Edinburgh has the most spectacular landscape of any in Britain*" (Gifford, J. et al., 1991: 21). Its layout is well integrated with its natural surrounding from the morphological point of view; this can be seen from the match of its structure with the topography of its site. The city is a mixture of urban areas within an overall urban structure, all being within just few minutes walk from the centre. "*At the East End of the city there stands, or rather crouches, the huge bulk of Arthur's Seat surely one of the few great hills in the world actually to be enclosed within a city's boundaries*" (Mc Laren M.1950: 11)

Figure 4.4 Edinburgh sandstone provides the main source of building material (The author 00).

Figure 4.5 Edinburgh's old houses give a certain identity to the city as a whole (The author 00).

4.4-Population Growth in Edinburgh

Figure 4.6 Princess Street mall in Edinburgh (The author 00)

Edinburgh is a medium sized European city, with a population of 448,850 (1996 estimate). The Scottish Office predicts a 2% population growth in Edinburgh, equivalent to 10,000 people, over coming years (Lord Provost's Commission, 1998: 16). It is the main service centre for south eastern Scotland, with many people from the Forth Basin and the borders commuting to work and shop in the city, a total travel to work area population of around one million. The economy of the city is expanding faster than the UK average at present and the population is predicted to grow by approximately 15,000 by 2006 (Lord Provost's Commission, 1998: 6).

4.5-Urban Development of Edinburgh

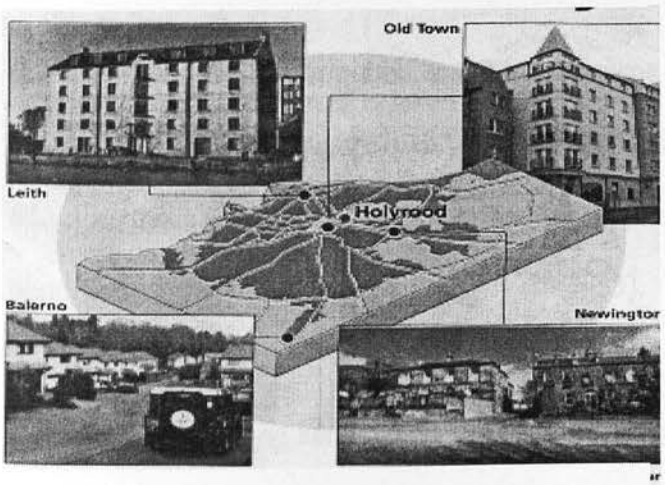


Figure 4.7 Urban development of Edinburgh. Source: Weekly, 15 January 1998: 1

The city has been under a continuous process of change. Edinburgh has, during the last 25 years, gravitated more and more to the west, both socially and demographically.

The biggest of the modern industrial estates are to the west of Edinburgh, as are the shopping and business park developments which go under the umbrella form "*the Gyle*". The airport is rapidly undergoing expansion to the west, and it is there that most of the major road improvements have also taken place.

Edinburgh is blessed with dense housing stock. Much of the city centre is made up of mixed-use neighbourhoods. While an uncharacteristically high number of people live in the centre, 40 percent of Edinburgh's 250,000 jobs are also located there. This ensures excellent accessibility by public transport (Mittler, D 1999).

4.5.1-Transport and air pollution

Transport and associated air pollution in Edinburgh has a significant impact on quality of life and health and is damaging to the city's economy. Edinburgh had one of the fastest rates of growth in car ownership in Europe in the 1980's, with a 57% rise between 1981 and 1991, and 90% of urban air pollution in Edinburgh is estimated to come from road traffic (The Lord Provost, 1998: 53).

Such pollution has major public health implications. Friends of the earth Scotland estimates that over 100 excess deaths per year in Edinburgh are caused by vehicle pollution. In addition, those with asthma and other respiratory complaints have been shown to have their condition aggravated by poor air quality (Ibid: 53).

Edinburgh's booming service and finance sector based economy has led to a rapid growth in car ownership. Between 1981 and 1991 the number of cars per 1,000 inhabitants rose by 47 percent, although Edinburgh started from a lower base and some 40 per cent of

Edinburgh's inhabitants remain without regular access to a car. Buses remain popular for journeys to work into the city centre.

4.5.2-Segregation

The number of workers living outside the city has increased dramatically. In 1971 only 13 per cent of people working in the city lived elsewhere. By 1991, this proportion had increased to 29 percent (Mittler, D 1999). Many of these suburbanites commute by car to employment nodes on the fringe of the city. They are aided in doing so by the city bypass, the one big road development that was built in Edinburgh since it facilitates the construction of the Gyle one of the biggest retail centres in Scotland (floor space 28, 000 m^2) complete with over 2000 parking spaces. The development, which is linked to a new office and industrial development known as Edinburgh Park, has been a disaster in terms of its retail and traffic impact (Mittler, D 1999).

4.5.3-Suburbanisation

In Edinburgh region a worse form of suburbanisation is taking place, with even more significantly negative transport impacts. With city centre prices rising more and more people are forced to buy houses in the Lothian region as they can simply not afford a suitable house in Edinburgh itself. Most suburban developments are very low quality and extremely low density. They are entirely car dependent.

4.5.4-Air pollution and traffic

As 90 per cent of all air pollution in urban Scotland comes from road traffic (Mitter, D 1999), developments such as the city bypass, suburbanisation, the Gyle, Edinburgh Park have caused the overall air quality in Edinburgh to decline. At present traffic emissions

combine to produce a lethal cocktail which causes 240 premature deaths in Edinburgh each year (Mittler, D 1999).

Summary

This section describes the urban developments and changes of Edinburgh. Edinburgh has benefited tremendously from its natural site, which has brought it recognition as being one of the most beautiful cities in the UK if not in Europe. The city is a mixture of urban areas within an overall urban structure, all being within just few minutes walk from the centre. Much of the city centre is made up of mixed-use neighbourhood. Edinburgh had one of the fastest rates of growth in car ownership in Europe. While an uncharacteristically high number of people live in the centre, transport and associated air pollution in Edinburgh has a significant impact on quality of life and health and is damaging to the city's economy.

Edinburgh's booming service and finance sector based economy has led to a rapid growth in car ownership.

In Edinburgh region mass suburbanisation is taking place, with even more significantly negative transport impacts. The city of Edinburgh has been under a continuous process of change due to urban growth. The biggest of the modern industrial estates are to the west of Edinburgh, as are the shopping and business park developments, which go under the umbrella form the Gyle.

4.6-Historical Background of Ottawa

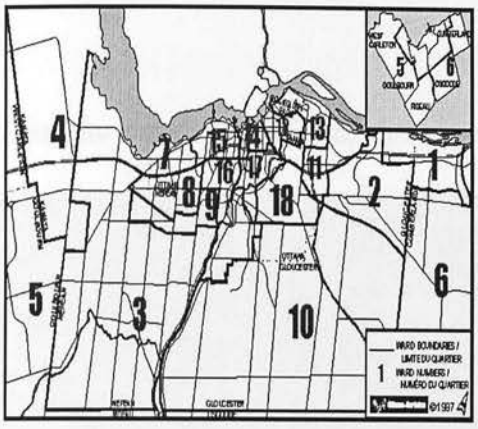


Figure 4.8 Ottawa the capital region. Source: RMOC, 1999

Ottawa is adapted from the Indian word, 'Odawa', meaning 'traders'. Odawa was the name of an Algonquin Indian tribe who settled and traded furs in the area. Ottawa was a perfect site for such commercial activities, being located at the juncture of three rivers - the Rideau, the Ottawa and the Gatineau. The first European to explore the region was Samuel de Champlain, in 1613. He was followed by settlers who developed the lumber industry along the river's edge. Around 1800, Philomen Wright, a United Empire Loyalist, led the establishment of the first settlement in the area at what is today Hull, Quebec (OTCA[1], 1999).

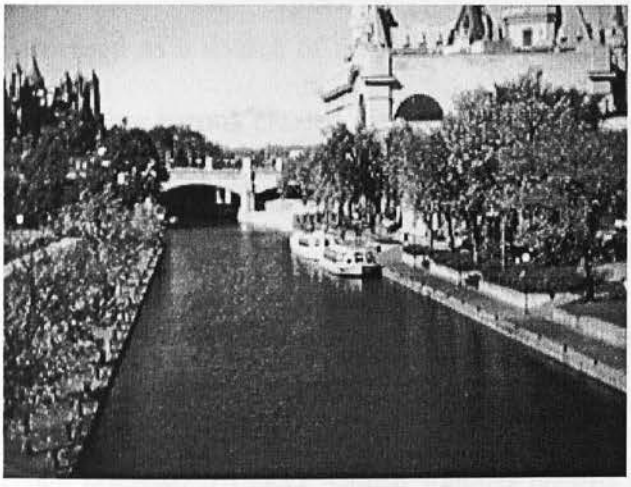


Figure 4.9 The Rideau canal in Ottawa (The author 99)

After the war of 1812, British military engineers led by Lt.-Col. John By, built the 202 kilometre-long (125.5 miles), 47 lock, Rideau Canal. Completed in 1832 at a cost of less than $4 million, the canal created a link to the St. Lawrence River that was safe from any future American

[1] OTCA: Ottawa Tourism and Convention Authority
RMOC: Regional Municipality of Ottawa Carleton

invasion. The Rideau Canal **(Fig 4.9)**, one of Canada's nine heritage canals, also helped pave the way for further settlement, trade and expansion of the lumber industry (OTCA, 1999).

When the canal was started, there were few settlers on the present day site of Ottawa, although Wrightsville, across the river in Quebec, was a thriving frontier town with an active logging trade. When the canal was completed, the settlement at its north end was named Bytown, in the Colonel's honour. Bytown was divided into two sections - Upper Town, where the Parliament Buildings are now situated, and Lower Town, across from the canal. After 1850, when the Chaudire Falls were harnessed as a source of mechanical power, the region became a major lumber producer and lumber barons created the largest concentration of milling operations anywhere in the world (OTCA, 1999).

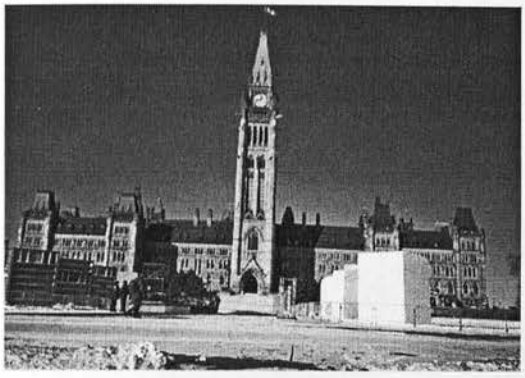


Figure 4.10 The parliament building. (The author 00)

By 1855, the population had risen to 10,000 and the city was incorporated under its present name to commemorate the 200th anniversary of the first descent of the Odawa Indians down the river. In 1857, Queen Victoria created a controversy by choosing Ottawa as the capital of the then British Provinces of Upper and Lower Canada. Opposition to the choice was loud and strong, especially from Kingston and Toronto, both of which considered Ottawa no more than a backwoods town, known mainly for its drinking and fighting.

In 1867, Ottawa became the capital of the Dominion of Canada, and it remains the seat of government and the centre of Canada's parliamentary system.

The imposing Parliament Buildings, completed in 1866, were modelled on Britain's Houses of Parliament. However, after a devastating fire in 1916 in which only the Parliamentary Library was saved, Ottawa's Parliament Buildings had to be almost completely rebuilt. The Peace Tower, in the Centre Block, was designed to be the tallest structure in Ottawa, and even today building height restrictions ensure it will not be dwarfed.

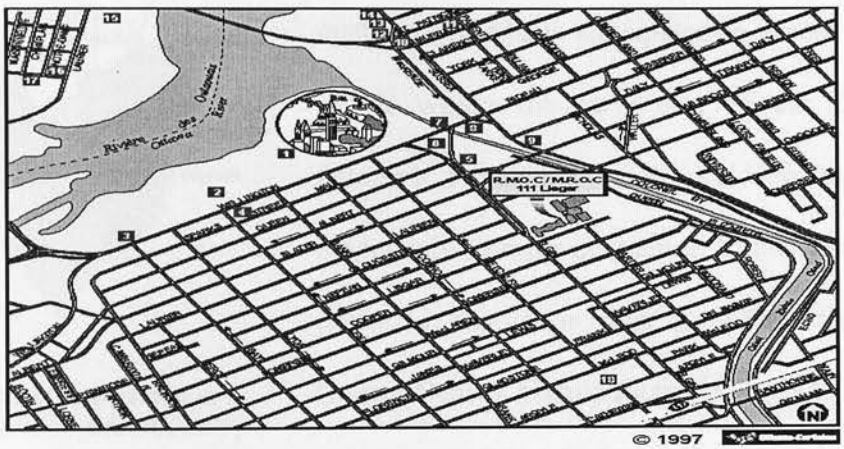


Figure 4.11 Downtown Ottawa. Source (RMOC, 1999)

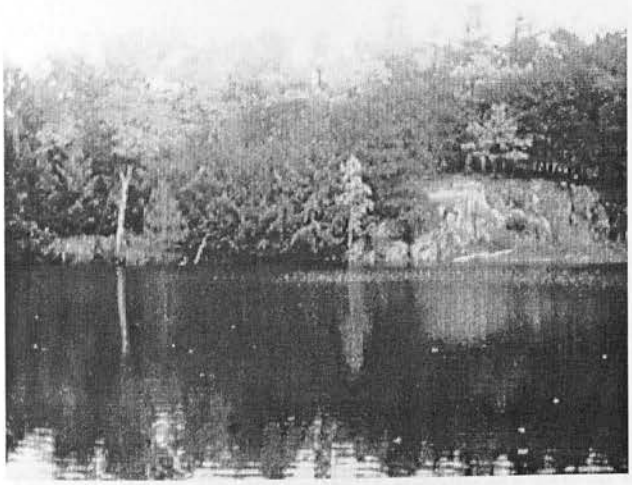


Figure 4.12 Gatineau park (The author 99)

Today's capital owes much of its beauty to the French planner, Jacques Greber, who was commissioned after World War II by Prime Minister William Lyon Mackenzie King to lay out a new plan for the city. His design is largely responsible for the Greenbelt which includes a large and functioning farm

inside the city, and the beautiful, expansive Gatineau Park **(Fig 4.12)**.

These two protected park areas, which are often referred to as the 'emerald necklace', surround the city with 532 square kilometres (205 square miles) of open space.

4.7- Population Change

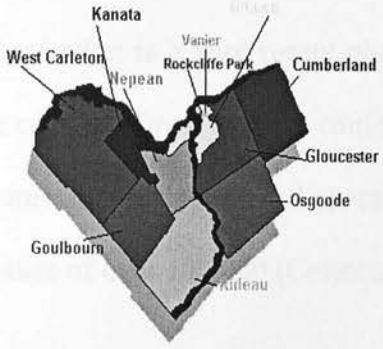


Figure 4.13 Municipalities in Ottawa. Source (RMOC, 1999)

From a regional context population of the Ottawa-Hull metropolitan area is anticipated to exceed one million people within the early part of the 21st century. Ottawa's population is expected to increase only moderately over the next ten to fifteen years with total projected population over a million (In 1996, the Ottawa Census Metropolitan Area (CMA) population was 1,010,498), including permanent and non-permanent residents.

4.8-The Urban Fringe

4.8.1-Location outside the city limits

The most rapid growth of population in Ottawa occurred in areas beyond the city limits and, therefore, beyond the city's control. This choice of location is related in part to differential tax levels which, like differential price levels, are a factor in pricing many people out of the city. Many people are priced out relatively rather than absolutely. They choose to move farther out in order to improve their residential status to become

homeowners, for example, or to have a large garden in place of a small yard. Other priced-out users are those requiring large blocks of land, such as airports, golf courses and educational institutions (Coleman 1969).

4.8.2-Historical basis of the fringe problem in Ottawa

The urban fringe represents a problem, not only because of its character but also because of its extent, which is rooted in the geographical pattern of settlement in North America.

Urbanisation is a very recent phenomenon in the world's history. By the year 1900 only one country, Great Britain, could be described as predominantly urbanised but since then urbanisation has proceeded apace and by 1960 a third of the world's population was living in cities of over 100,000 (Coleman, 1969).

The distribution of city size varies according to the time available to each country for the establishment of pre-urban settlement patterns. Western Europe, for example, was largely settled in the dark ages after the fall of the Roman Empire when man was closely dependent upon agriculture. Individual homesteads, hamlets or villages were close together, since each had to have its territory within feasible daily walking distance of the next (Coleman, 1969).

Everyone, not only the farmers, lived in small settlements. As agriculture prospered to the point of producing marketable surpluses, certain villages grew into market towns, but these too were relatively close to the hinterlands they served, as they had to be within periodic excursion distance for animal-drawn carts.

Moreover, these towns did not unduly attract population from the villages as their centripetal force was offset by air and water pollution and by a lack of garbage disposal, and consequent health hazards. By the time the industrial and transport revolutions and improved services permitted the growth of really large cities there were numerous well-established smaller centres which have continued to thrive, so that the size ranking of Western Europe towns forms a well-distributed curve (Coleman, 1969).

North America, by contrast, was largely settled in the period when trade, manufacturing potential, and knowledge of urban servicing were sufficiently advanced to permit the towns to develop as comfortable and viable living environments, and to do so more quickly than the country. Moreover, it was easier to congregate in existing towns than to create new ones. The towns themselves tended to remain fewer but to grow faster than those of the old world, and this pattern has become progressively entrenched as the larger cities continued to offer more facilities and to attract more people.

This is very true for Canada where a third of the population is concentrated into seven leading conurbations (Coleman, 1969). Conversely, the farm-scape population has been reduced almost to farmers only, and there is relatively little continuation of the tradition of intermediate-sized settlements of between 5,000 and 50,000 people. There are no centres of this size in Carleton (Ottawa) and Russell counties. As a result, the spatial or potential advantages of such centres are not well known or sought after and, unless located near enough to a metropolis to function as satellites, the size of such centres tends to remain static in a land of expanding population.

As the bulk of the population is concentrated in the cities, so the bulk of population expansion is concentrated in their urban fringes. The rapidity of fringe growth is phenomenal; the extent of land consumed is greatest here in relation to population growth, and it is also here that the nation's most difficult planning problems are engendered (Coleman, 1969).

In the past the fringe problem was intensified by the lack of corresponding policy between urban areas and local government areas. The leapfrogging of new development down the price gradient, beyond the tax barrier and outside the city's zoning control, has carried the bulk of urban fringe growth into rural townships that lack the planning machinery necessary to promote orderly expansion. As these fringe townships may fiercely resist the fact that they regard as predatory annexation by the central city, consequently much annexation is delayed until problems have become sufficiently acute to out-weigh resistance. The city then inherits a diseased, problem-ridden fringe area which it must try to cure, but in most cases it is powerless to annex healthy areas while there is still time for preventive treatment (Ibid.).

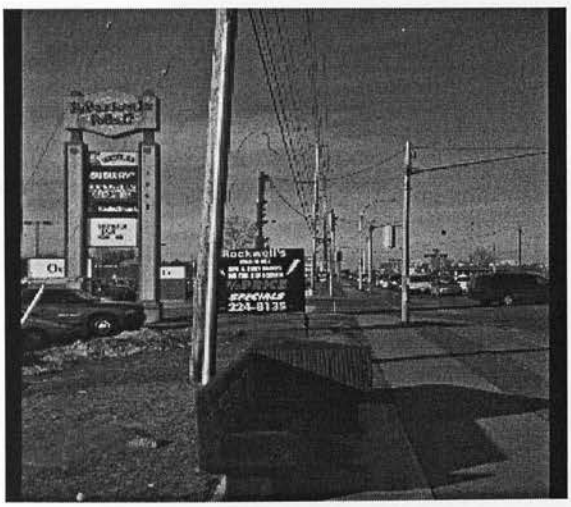


Figure 4.14 Suburban fringe in Ottawa (The author 99)

4.9-Description of Typical Urban Sprawl Characteristics in Ottawa

Generally speaking urban sprawls in Ottawa consist of low-density housing. New developments relate to highways leading into the cities.

The highways in Ottawa accommodate high tech firms such as Nortel, JDS Uniphase, businesses, motels, shopping centres (malls) and services. Usually it is almost solely accessible by car. Often pavements are not even provided. The roads through those urban sprawls in Ottawa may have up to six lanes. It is virtually impossible to cross on foot, or by car, leading to duplication of services on each side of the highway. Land uses are segregated, since nearly all activity relates to the strip.

The spread of suburban sprawl in Ottawa creates a stretch of uniformly developed land and the artificial nature of imposed landscape and architecture does not create much local identity or sense of place. In this urban sprawl there is little community life that relates directly to location or form. Residents are mobile and have easy transport and communication links with other areas for work and play. The car and phone are private forms of communication and do not operate on a level that allows space for chance or random communication and therefore social life in the urban sprawl is dependent upon pre-arranged meetings and communication.

4.10-Problems Created by Urban Sprawl in Ottawa

4.10.1- Destruction of land and waste space

Suburban sprawl reduces another finite resource: land. Related to that destruction is the issue of wasted space in low-density urban sprawl. Development is not the problem, there is clearly enough space but the type of development - low-density, resource inefficient sprawl - is a problem. In order to illustrate this wasted space the following pictures are included.

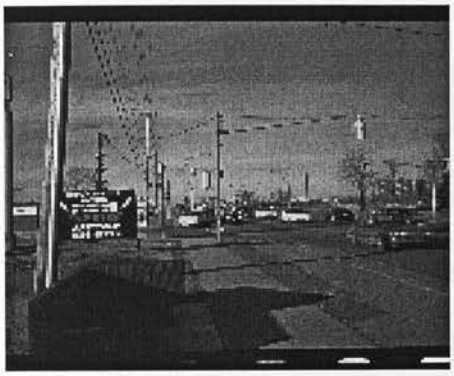


Figure 4.15 Wasted space and hard surfaces (The author 99)

Figure 4.16 A typical shopping mall is a town centre separated from its community by a parking (The author 99)

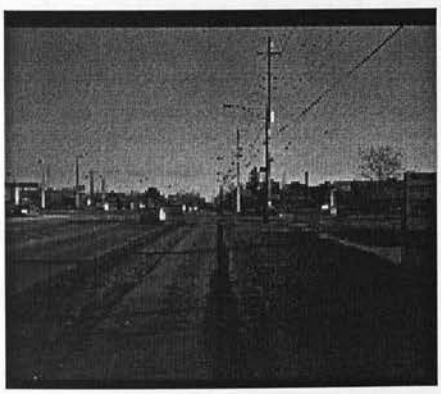


Figure 4.17 Suburban strip in Ottawa (The author 99)

Figure 4.18 A shopping mall in a suburban fringe in Ottawa (The author 99)

4.10.2-Hard surfaces

Much land is used for parking and vehicular circulation. Drainage and loss of vegetation cover are primary side effects. The drainage system has been seen as a possible factor in creating water shortages and droughts. It is clear that the disposal of the valuable resource of water in this manner is a waste. On an aesthetic level, land covered by hard paving is barren, non-productive and harsh, it offers no natural climatic shelter and is generally unattractive.

4.10.3-The car

The hard surfaces in the city are built primarily to satisfy the needs of the automobile. The car is one of the major problems with the suburban design. Apart from the environmental effects of pollution on a global scale, and the depletion of non-renewable resources, there are pressing problems created on a local scale. These range from suspended particulate pollution in the air and lead and petroleum pollution in local water systems, to dangers for children, isolation for those unable to drive, congestion and, perhaps most important in community design terms, the break-up of space, the need for garaging, parking and the fragmentation of pedestrian circulation systems.

4.10.4-Congestion

The car also defeats its original objectives of speed, ease and economy. Congestion exacts massive amounts of time from the working day, yet it has become a part of Canadian life in general.

4.10.5-Isolation

The car is one of the main causes of suburban isolation. For example if a person drives to work, to the shops, to the doctor and then drive back to the house through a radio-controlled garage door, he or she has very little chance of social contact with neighbours unless it is previously planned. The street layout exacerbates the problem, for instance, the classic layout with the one found in the sprawl development.

4.5.6-Other problems

Suburban structure and lifestyle demands private car transport, thus creating the multitude of problems described above. However, the car is not the only source of pollution. Suburbs generate pollution in the form of fertilisers and pesticides as well as from oil, petrol, cars and trash. Attitudes toward the natural landscape require the control of chemicals that cause so much ecological damage.

4.10.7-Low density planning and housing

One of the causes of this 'shallowness' is the conventional approach to planning which employed a system based on land-use zoning and the segregation of land use. Such zoning is apparently a result of heavy industry and the need to separate people's home from areas of noise and pollution.

4.10.8-Individual needs

Within the suburbs individual needs are ignored. Car based transport and vehicular layout for housing areas leaves the old, the young and the disabled completely trapped. Add to this the centralisation of services and the interaction and individual knowledge of one another which stems from local services, such as grocery deliveries, becomes diluted or lost. Thus there is little casual care within the community.

4.10.9-Communication problem

Community life lacks day to day, face to face, chance communication which is an important element in building up the web of relationships forming community life. Reasons for the lack of this type of communication again relate to suburbia's reliance on car transport.

4.11-Sprawl as an Urban Phenomenon

Sprawl is a fringe phenomenon which is becoming progressively better understood. It could not effectively exist while the masses walked and the privileged few rode horseback. In those circumstances a settlement had to be compactly arranged within walking distance if it was to function at all. The advent of sprawl entailed the loss of 'walking distance' as a functional concept, so the elimination of sprawl entailed giving this concept a renewed and more complex significance. The subtleties of the concepts of *walking distance* within the townscape has been explored by Jacobs (1961) and is here extended to apply to the urban fringe.

Alice Coleman (1969) has recognised four sequentially different types of sprawl:

One-dimensional or strip sprawl

One-dimensional or linear sprawl was the earliest type. Under the name of 'ribbon development' or 'strip sprawl' it arose where some linear form of transport, such as a car or bus route, gave people a one-dimensional independence from walking distances. Its effect was to blur the spirit of place into an elongated monotony (Coleman, 1969).

Two-dimensional or area sprawl

Two-dimensional or area sprawl came at a later stage and was made possible by the mobility of the private car. This allowed easy access to isolated new homes and to isolated new subdivisions. Extensive individual frontages and gap sites were no longer so tiresome.

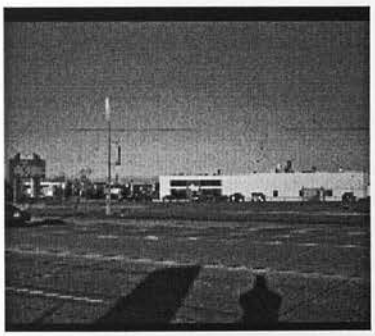


Figure 4.19 JDS Uniphase Ottawa (The author 99)

Figure 4.20 High Technology firm outside the town in Ottawa (The author 99)

Figure 4.21 Suburban strip in Ottawa (The author 99)

Figure 4.22 Loss of place (The author 99)

Figure 4.23 Space for cars Billing Bridge mall in Ottawa (The author 99)

or boring to pass as they had been on foot and their impact was reduced. Thus two-dimensional sprawl made even greater inroads than one-dimensional sprawl upon the usefulness of walking distances and removed the individual even more completely from contact with the area he or she traversed.

Three-dimensional or thin-skin sprawl

Figure 4.24 A parking space in downtown Ottawa (The author 00)

Although in the course of time area sprawl may be replaced by compactness, a third type of sprawl may still be present in that the town spreads as a thin skin of low buildings. This third phase of sprawl becomes generally recognised as people are made aware of long and often uninteresting frontages to be traversed. This coincides with the moment when the advantages of car transport begin to be eroded by disadvantages such as traffic congestion, delays and parking difficulties (see **Fig 4.24**). It has become no longer easy to park at will within a minimal walking distance of every ultimate destination. The car itself accentuates three-dimensional sprawl by expanding the acreage of ground-level-

only uses in the form of car parks. A vicious circle is set up whereby car parks themselves increase walking frontages excessively and so stimulate a greater use of cars and a clamour for more car parks.

Four-dimensional sprawl

Coleman's interpretation of the fourth dimension is represented by time sprawl (Coleman, 1969: 18). This is a feature of large cities and can exist even in the absence of sprawl in the first three dimensions. It depends on the spatial arrangement of different city functions and the time taken in moving from one to the other. It can be explained by reference to the two-time sprawl diagram **(Fig 4.28)**. In each diagram the home is placed at the centre of a constellation of places visited. The line linking the home with each place is proportional in length to the time taken to get there and proportional in width to the number of visits made.

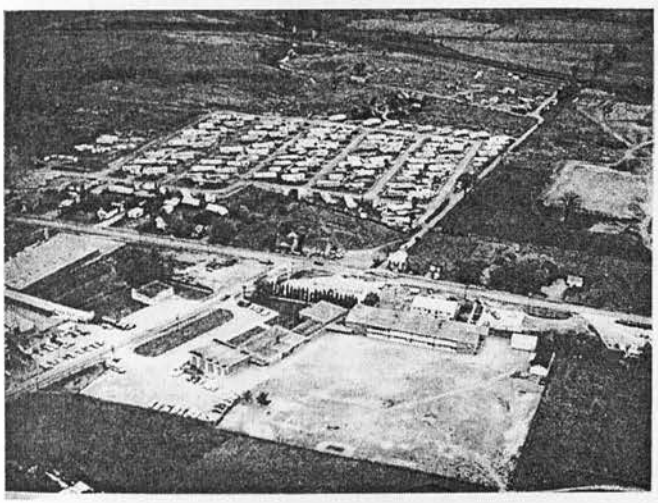


Figure 4.25 Urban fringe in Ottawa (Source Alice Coleman, 1969)

Diagram *A)* represents a well-planned community where most of the repetitively visited elements are within walking distance of the home and each other. If the husband can walk to work, the wife to the shops and the children to school they not only save to themselves time, money and fatigue, but they also do not

contribute to the city's peak traffic congestion. However, where the planner's, ideas of neat zoning regulations have made the time sprawl constellation large enough to need transport along one or more of its rays as in diagram ***B)***

4.12-High Technology Sector in Ottawa

Figure 4.26 JDS Uniphase a high-tech firm in the fringe of Ottawa (The author 1999)

The high technology sector accounts for approximately 30,000 direct jobs in Ottawa. This is a prized sector of the regional economy, responsible for much of Ottawa's economic growth and diversification since the mid 1970s. Many of high technology firms in Ottawa are world class (JDS Uniphase, Corel, and Nortel) in scale and reputation. Generally speaking the high technology industries are volatile, as they are dependent on international markets. Moreover, while growth prospects for the area's high-technology industry cannot be assessed in isolation, it is certain that the world is continuously becoming more automated and relying more heavily on technology than ever before. While there will be fluctuations, the long-term outlook for high-technology products and services is quite favourable. Despite the fact that a number of high technology firms have gone out of business in Ottawa since the mid 1970s, the overall growth has been phenomenal. In terms of employment, the total number of high tech jobs in Ottawa in the early 1970s was approximately 4,000. Compared to today's estimate of 30,000 jobs, there has been a growth rate of over 650% in less than 20 years (City of Ottawa Office Plan, 1999).

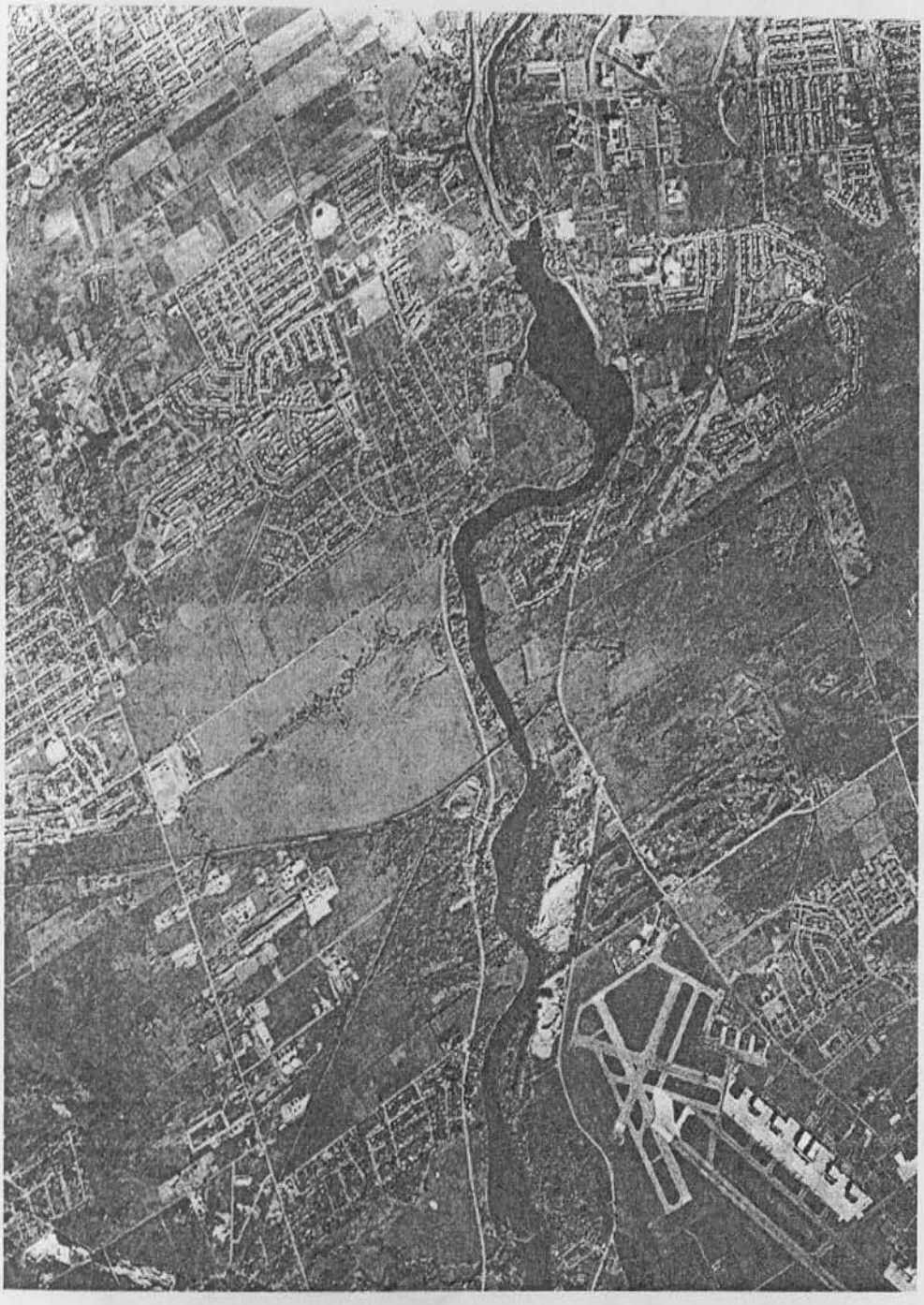


Figure 4.27 Figured ground of the urban fringe along the Rideau Canal south of Ottawa (Source Alice Coleman, 1969)

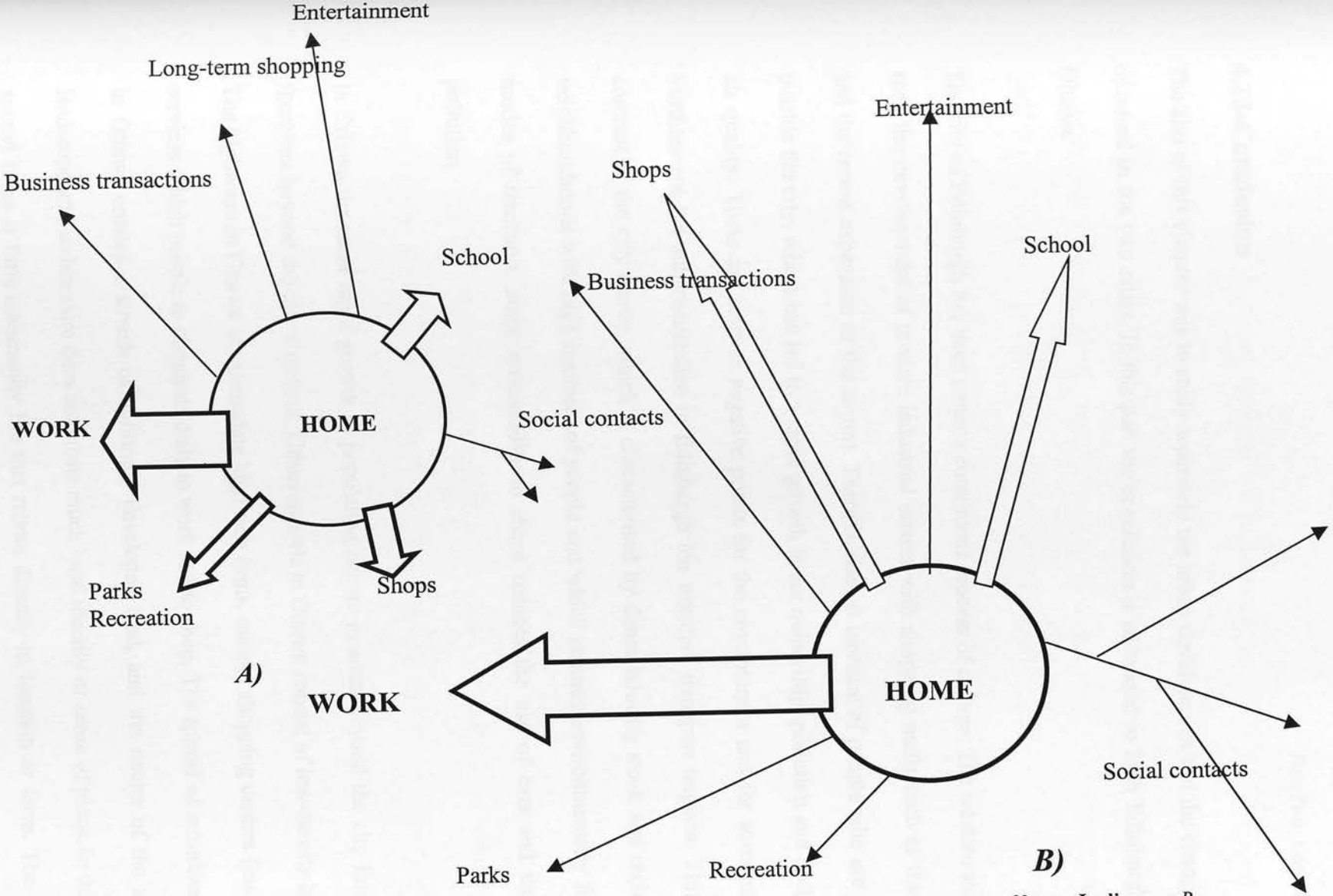


Figure 4.28 Time sprawl. In diagram *A* most of a family's daily repetitive destinations are within walking distance of home. In diagram *B* transportation is required often at peak traffic hours, to reach some or all of these destinations

4.13-Conclusion

The aim of this chapter was to study separately the urban development and the change that occurred in the two cities. In this part the conclusion is addressed to both Edinburgh and Ottawa.

The city of Edinburgh has been under a continuous process of change. The western side has seen the development of modern industrial estates with shopping malls such as the Gyle and the recent expansion of the airport. There is also an increase of people who are living outside the city, which has led to a rapid growth in car ownership, pollution and decline of air quality. These are seen as negative points for the environment and for sustainability. Furthermore the suburbanisation in Edinburgh has negative transport impacts. This is in contrast to the city centre, which is characterised by dense housing stock and mixed use neighbourhoods with high numbers of people and which ensures environmentally friendly modes of transport, since accessibility to shops reduces the use of cars and therefore pollution.

In Ottawa the most rapid growth of population occurs in areas beyond the city limits and therefore beyond the city's control. Urban sprawls in Ottawa consist of low-density housing. The highways in Ottawa accommodate high tech firms, motels, shopping centres (malls) and services which people to commute daily to work and to shop. The spread of suburban sprawl in Ottawa creates a stretch of uniformly developed land, and the nature of the imposed landscape and architecture does not create much local identity or sense of place. In this urban sprawl there is little community life that relates directly to location or form. The car is a private form of communication and does not operate on a level that allows for chance or

random communication; therefore social life in the urban sprawl is dependent upon pre-arranged meetings. Suburban sprawl reduces the availability of land. Related to that destruction is the issue of wasted space in low-density urban sprawl. Development is not the problem: there is clearly enough space but the type of development - low-density, resource inefficient sprawl - is a problem. Much land is used for parking and vehicular circulation. The car is one of the major problems of this kind of suburban design. Suburban structure and lifestyle demands private car transport, thus creating this multitude of problems. However, the car is not the only source of pollution. The problems of pollution and depletion of resources are increased by the social and ecological problems outlined in this part.

To fulfil the main objectives of the research which will contribute to understanding of how to sustain urban systems the author considers that people are an important part of the whole system. Understanding how people evaluate their environment can give an idea about how to contribute into sustaining the urban environment. In order to do so a questionnaire has been used. The next chapter will describe thoroughly the questionnaire method, as well as different methods of analysis, which are used for analysing the questionnaire used in this research.

Chapter 5

The Questionnaire

CHAPTER 5

THE QUESTIONNAIRE

5.1- Introduction

Research should be based on an overall view of man's relation to the environment. In this broad perspective man appears as an active, creative being who influences and is influenced by his surroundings. The physical environment is part of the total environment in which we live and must therefore be studied from the standpoint of the potential it possesses for providing favourable conditions for human life.

This study attempts to provide a deeper insight of people's satisfaction with their urban environment. In order to achieve such goals, the research requires a strategic framework. Such framework can provide guidance in selecting particular techniques or methodological practices for specific settings. The purpose of this chapter is therefore to generate a strategy and describe a whole picture of this study. It discusses the general approach of the research, the methodology of the survey research for data collection then is further expounded. The data analysis and interpretation strategies are also briefly discussed.

Lang and Brunete state that environmental research must follow a systematic procedure. This procedure consists of interrelated and sometimes simulative events which have a logical order: formulation of the problem; establishment of research design; selection of measurement procedures; collection of data; analysis and interpretation of findings and application of information to problem (Assi 1998).

Therefore, the research process involved in this study could be described as following: construction of the research statement; establishment of the research design; selection of the data collection methods, performance of the survey research, analysis and interpretation of the data and finally application of findings to the problem.

Canter argues that the study of man-environment relationship has changed the emphasis of environmental research from a focus on the consequences of environmental manipulations to a careful consideration of their implication (Ibid).

Environmental psychology is one of the disciplines used by researchers to examine people's interpretations of their environments. This issue has been widely addressed these days with different approaches ranging from the individualistic or micro level to the social, or macro level.

Citizens involvement, through understanding the system by which they evaluate their own environment, is one of the preferred means of dealing with any cultural development or decision-making process, because in the end, future settings are for people to live in and appreciate. Major consideration of people's values is recommended to avoid disintegration and disassociation of the individual with his or her own environment.

5.2-Method

The main objective of the research is to contribute into sustaining the urban system through people's perception. Man is adapting continuously and actively to his surroundings by changing both himself and the environment.

Two case studies, which focused on the interpretation of the urban environment in the cities of Edinburgh and Ottawa, were used to facilitate understanding of the complexity of the issues related to the research topic (sustaining urban systems). The analysis of the case studies (questionnaire) was divided into two parts, each of them using a different method to explore or study certain aspects of the research problem. Using more than one method allows the researcher to confirm his findings through cross checking between methods. This will enhance the validity of the research and consequently add more sensitivity to it.

The analysis uses the following techniques:

1- Analysis of Edinburgh and Ottawa (Using frequencies) (Chapter 6)

2- Correlation and factor analysis for Edinburgh and Ottawa (Chapter 7)

The first section of the analysis, an analysis of Edinburgh and Ottawa, aims to find differences and common interpretations which enrich our understanding of the results by using frequencies.

The second section is conducted by investigating relations that might exist between variables and factors. A correlation and factor analysis were used in this purpose **(see Table 5.1)**

A pilot study (10 people) was carried out to refine the final questionnaire. In this Chapter (section 5.6) shall look at the summary of the pilot survey.

5.3-The Survey

The survey involved 55 households and was carried out across Edinburgh during August/September 1998, and 37 households from Ottawa during September 99. It consisted of a random selection of the population. The questionnaires, which were devised along lines suggested in the pilot study, were distributed randomly by post to different areas in each case study from Queensferry, Leith and Bruntsfield in Edinburgh and Nepean and Hull in Ottawa.

5.3.1-The Questionnaire

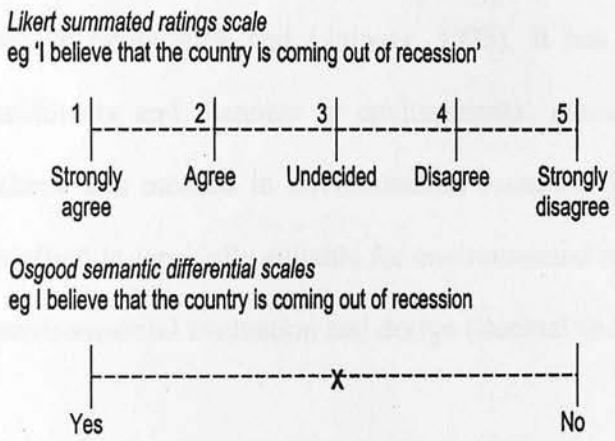


Figure 5.1 Scale used in the questionnaire (Source: Aspinal, 1997)

The questionnaire uses different types of questions. Questions frequently asked used a five-point scale and consisted of a mix of questions (see **Fig 5.1**) of different nature. The first section of the questionnaire consisted of general questions about the age and gender of the respondent. These are called classification questions and help to classify the answers statistically. Usually, classification questions come either at the beginning or at the end of a questionnaire. They are kept as short and simple as possible. The second section of the questionnaire consisted of general questions related to the home: questions related to ownership, housing type, length of tenure and

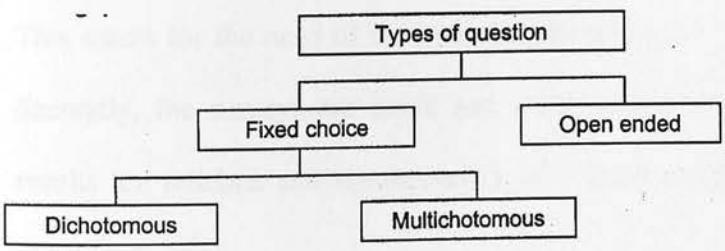


Figure 5.2 Question types (Source: Aspinal, 1997)

housing satisfaction. The third part of the questionnaire consisted of questions about evaluating the neighbourhood (see **Fig 5.6, 5.7**).

5.4-The Method of Sample Survey

Survey methods as a combination of direct communication techniques such as interview and questionnaire have been developed and widely used not only by social scientists but also environmental researchers.

The sample survey as a major feature of survey research has been defined as a study in which information is gathered from a fraction of the population chosen to represent whole (Wharwick and Lininger, 1975). It has also gained wide acceptance among architects and planners in environmental research. There are certain characteristics about this method in environmental research. These characteristics suggest that this method is especially suitable for environmental researchers who wish to collect data for environmental evaluation and design (Bechtel and Michelson, 1987).

Since the sample survey has gained wide acceptance among architects and planners in environmental design in view of its certain characteristics, it has been used as a the main data method of collection for the field work of this research because of its advantages. Firstly, the data from the survey permit comparisons between population at the different sites (Bechtel and Michelson, 1987: 47).

This caters for the need of the research objectives in evaluating people's satisfactions. Secondly, the surveys are quick and cheap and if they are properly conducted, the results are reliable, and representative of a much wider population than that directly

investigated. Therefore, sample survey is suitable to for study in respect of research objectives, situation and time.

5.4.1-Random sampling

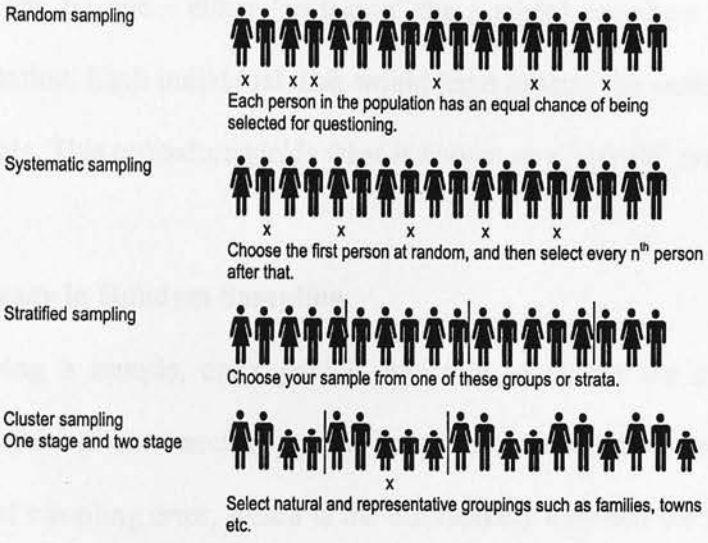


Figure 5.3 Sampling technique (Source: Aspinal, 1997).

The term 'random' refers to the process by which a sample is chosen from an environment; the term does not refer to a given sample. It may be correct to say that a sample has been 'randomly chosen', but it is not correct to say that 'the sample is random' in the long run and on the average.

A random sampling process produces representative samples, but a given sample is not likely to be perfectly representative, and hence it is not strictly correct and may be misleading to call a given sample 'random'.

A randomly chosen sample is a 'fair' sample, in the sense that every member of the society has an equal chance of being included. Not all samples are random. A biased

sample is one that is not drawn randomly and that therefore does not represent all parts of the society.

In theory taking a sample randomly is perfectly easy: just put the names of all members of any social situation into a hat, shake them well, and take out those to be included in the sample, one by one - either 'replacing' the sampled members or not, depending upon the situation. Each individual then would have exactly the same chance of getting into the sample. This procedure yields what is known as a 'simple' random sample.

5.4.2- Efficiency in Random Sampling

When choosing a sample, one's goal is typically to obtain the greatest amount of information of the greatest accuracy at the least cost. One crucial measure of accuracy is the amount of sampling error, which is the discrepancy between the results one obtains from a given sample and the results one would obtain from a study of all the members of all members of the relevant universe. Sampling error occurs because, while a random sample is likely to be highly similar to the whole community from which it is drawn, it is unlikely to be identical.

A major advantage of random sampling or any other kind of probability sampling in which the likelihood of being included in the sample is statistically determinate, is that the amount of likely sampling error can be calculated in advance. This fact enables us to determine the trade-off between the accuracy (in term of sampling error) and the cost of obtaining a sample.

5.5-Tests Statistical Analysis in Quantitative Research

This part is an attempt to describe several statistical tests that have been used in the analysis.

Computer analysis

SPSS (Statistical Package for Social Science) is a tool of analysis used in social sciences; the tool mainly used in the case studies to help find correlations between variables. The author also uses factorial analysis for simplifying variables.

5.5.1- Correlation Analysis

Correlation is used to find associations between two variables. That is it does not assess whether one variable causes another, but simply whether their patterns of variation share any characteristics.

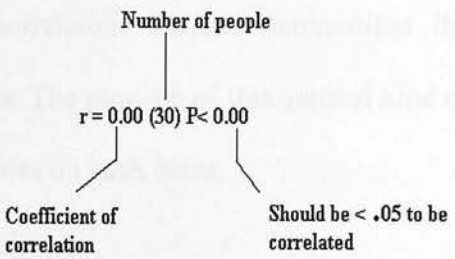


Figure 5.4 Correlation coefficient (Pearson correlation)

Correlation is the measure and study of two variables. It leads to the discovery of direct, causal connections between variables and in order to do so we need to calculate the descriptive statistic known as the coefficient of correlation, usually represented by r, also called (Pearson r) (see **Fig 5.4**). This represents the strength of the linear relationship between two variables.

Scientists basically measure three things: variables, the chances that data about variables are meaningful, and relationships between variables. Each of these measurement tasks has distinctive approaches and statistical devices. As we look at the

ideas used in accomplishing these tasks, we should remember that measurement almost always looks more precise than it really is (Hoover, 1988).

Establishing the degree of association between two or more variables leads to the central objective of this type of scientific enterprise. Scientists spend most of their time figuring out how one thing relates to another and structuring these relationships into explanatory theories (Hoover, 1988).

For certain applications, statisticians have developed a more sophisticated tool for specifying relationships between variables: correlation analysis (Hoover, 1988). The essential idea of correlation is to describe statistically the association between variables. Assuming all other conditions are equal, a correlation statistic summarises the movement of two variables in relation to each other. The purpose of this general kind of measurement is to characterise the impact of variables on each other.

5.5.2- Factor Analysis

Factor Analysis is a tool that calculates whether the responses to a large group of variables can be defined in terms of a smaller number of factors, in other words, it is a method for simplifying complex sets of data. Royce (in Kline, 1996) defines a factor as a dimension or a construct which is a condensed statement of the relationships between variables. When a Factor Analysis is computed, each variable has a factor loading which expresses the correlation between the variable and the factor.

Factor Analysis refers to a variety of statistical techniques whose common objective is to represent a set of variables in terms of a smaller number of hypothetical variables. At one extreme, the researcher may not have an idea as how many underlying dimensions

there are for the given data. Therefore, factor analysis may be used as an expedient way of ascertaining the minimum numbers of hypothetical factors that can account for the observed co-variation, and as a means of exploring the data for possible data reduction.

But the use of factor analysis need not be confined to exploring the underlying dimensions of the data. Depending upon the knowledge of the researcher, the method can be used as a means of testing specific hypotheses. For instance, the researcher may anticipate that there are certain different underlying dimensions and that certain variables belong to a certain dimension. If factor analysis is used to test this expectation then it is used as a means of confirming a certain hypothesis (Assi, 1998).

5.5.3-Descriptive Analysis

A Descriptive Analysis is one of the techniques used in research to describe the variables. Standard deviation is one kind of descriptive analysis, which describes the distribution or the spread of responses of the respondents for particular variables. In this part of this research Standard Deviation. (SD) was used to describe the distribution of rating taken for respondent.

TESTS

1- Correlation

Correlation is used to find *association* between two variables. That is we are not assessing whether one variable causes another, but simply whether they vary together

2- Factor analysis

Factor analysis is a tool that calculates whether the responses to a large group of variables can be defined in terms of a smaller number of factors, in other words, it is a method for *simplifying* complex set of data. The factor analysis procedure offers a high degree of flexibility.

Table 5.1 Different tests being used in the analysis

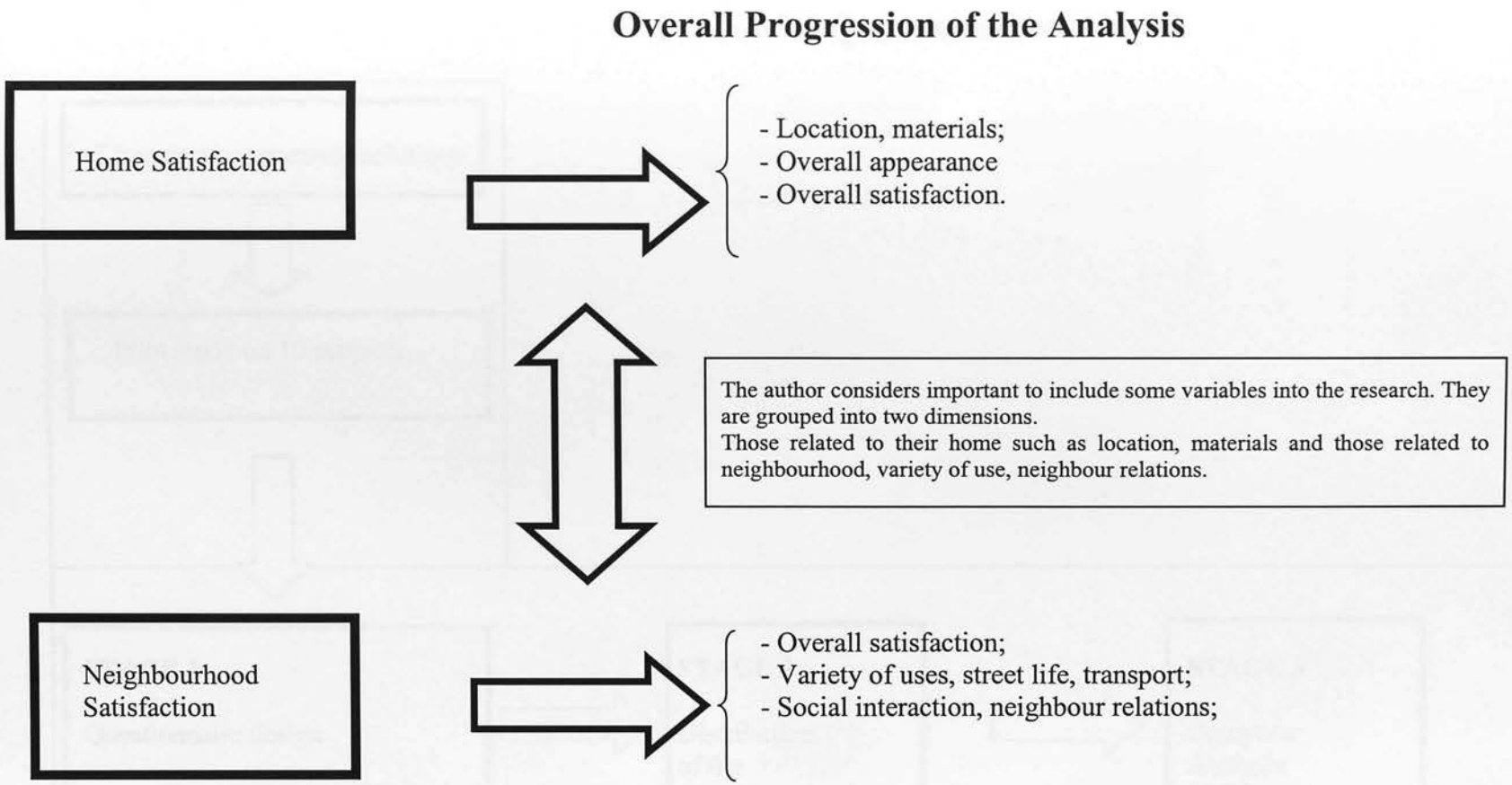


Figure 5.5 Overall progression of the analysis

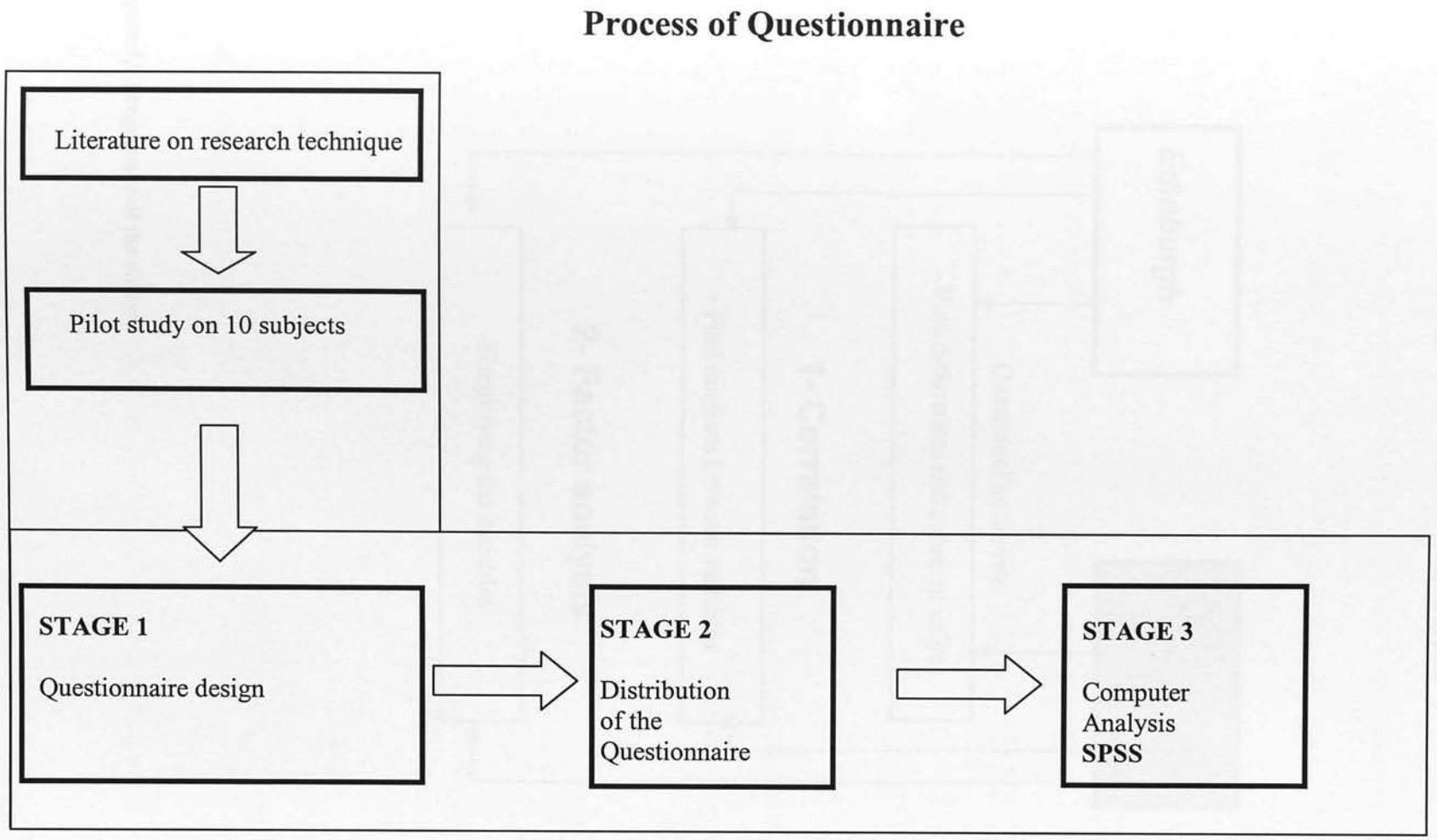


Figure 5.6 Process of questionnaire

Progression of the Analysis

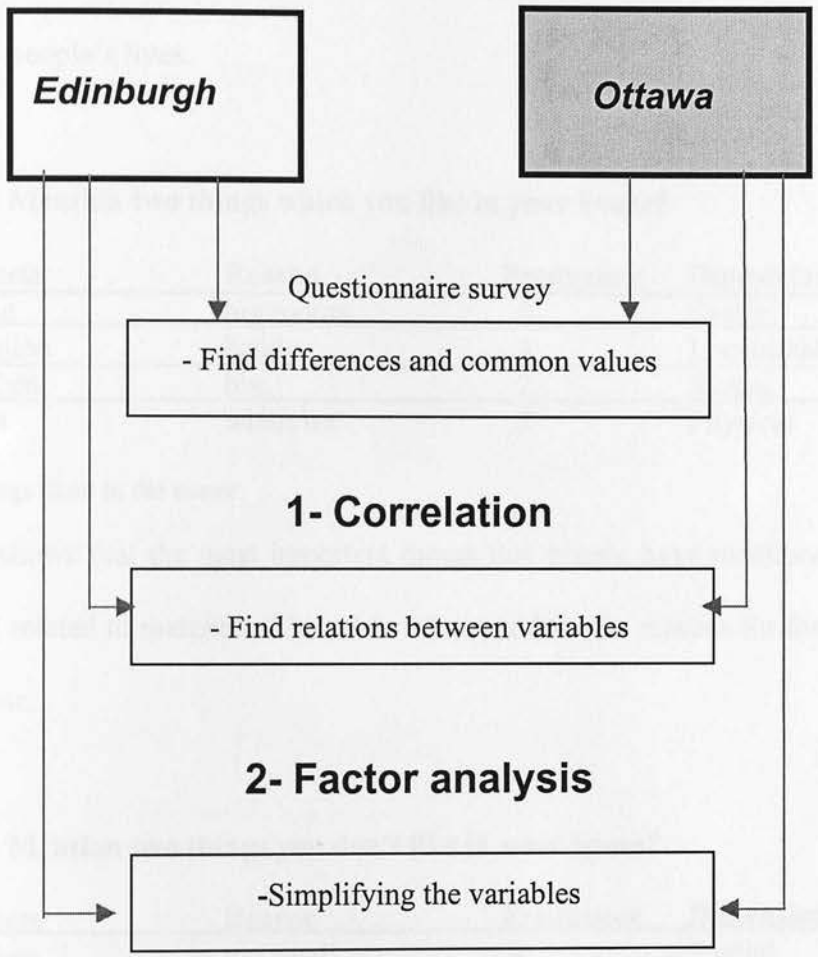


Figure 5.7 Progression of the analysis

5.6-Summary of the Pilot Study

As mentioned earlier the pilot study was carried on 10 people in Edinburgh mainly to refine the questionnaire. Questions were left open-ended, and the responses were related to the immediate social and physical environment. It was intended that these questions should evoke responses about personal need, social tendencies, and other characteristics that are important in people's lives.

Question 1: Mention two things which you like in your house?

Objects	Reason	Frequency	Dimensions
Space	big rooms	5	Spatial
Location	handy	3	Locational
Kitchen	big	2	Spatial
Light	windows	2	Physical

Table 5.2 Things liked in the house

Question 1 shows that the most important things that people have mentioned are spatial, location and related to materials. The **table 5.2** above lists the reasons for their satisfaction with the house.

Question 2: Mention two things you don't like in your house?

Objects	Reason	Frequency	Dimensions
Kitchen	too small	3	Spatial
Neighbours	noisy	2	Privacy
Noise	street	1	Noise
Walls	too thin	1	Physical
Entrance	security	1	Psychological
Lack storage	lack of space	1	Space

Table 5.3 Things disliked in the house

Question 2 show the most important thing disliked in the house, spatial and lack of privacy as it can be seen in the **Table 5.3**

Question 3: Can you mention what you like in your neighbourhood as a place to live?

Object	Reason	Frequency	Dimensions
Proximity	close to centre	4	Spatial
Shops	availability	3	Physical
City centre	more people	2	Social interaction
Street life	colourful	1	Social
Library	it's close	1	Proximity
Police station	security	1	Security

Table 5.4 Liked reasons as a place to live in the neighbourhood

Question 3 shows that the most important things that people like in their neighbourhood, proximity was mentioned as being close to centre followed by shops and city centre.

Question 4: What you dislike about your neighbourhood as a place to live?

Object	Reason	Frequency	Dimensions
Noise	traffic/road	4	Physical
Neighbours	not friendly	1	Social

Table 5.5 Disliked reasons as a place to live in the neighbourhood

Question 4 shows that the most important things that people dislike in their neighbourhood, noise was mentioned because of traffic.

Question 5: Can you mention two things that you like about your place of work?

Object	Reason	Frequency	Dimensions
Proximity	walk and cycle	3	Spatial
Staff	friendly	3	Social
Wages		1	Economic

Table 5.6 Things liked about the place of work

Question 5 shows that the most important things that people like in their place of work is proximity.

Question 6: Can you mention two things that you dislike about your place of work?

Object	Reason	Frequency	Dimensions
Too far	distance	1	Spatial
Place	dirty	1	Physical
Noise	music	1	Psychological
Not busy		1	Social

Table 5.7 Things disliked about the work place

The variables identified in the pilot study (see Fig 5.5) were used in the main questionnaire (55 in Edinburgh and 37 in Ottawa) in order to find out how residents assess their environment.

5.7-Conclusion

The research method addressed in this chapter, responding to the problem of urban growth that have been looked at in the introduction and the Chapter 1 on sustainability. The research method comprise the literature review as well as the methods of questionnaire and the open-ended questionnaire (see chapter 8) which have been used in the research in order to have a deep understanding of people's evaluation in their urban environment.

The questionnaire and the open-ended questionnaire used in the research comprises two types of questions fixed choices and open-ended. The first types of questions, which are fixed, are rated on a scale of five. The second types of questions were open-ended to give more freedom to the interviewee to express his or her opinion.

This chapter summarises of the pilot study which was conducted on 10 people in Edinburgh, the purpose being to refine the questionnaire. Variables were considered important to the research in a way they contribute into sustaining the urban system which

are related to the goals of sustainability (environmental, social and economical see Chapter 1) were also introduced in the final questionnaire.

A section of the questionnaire consisted of general questions related to the home: questions related to ownership, housing type, length of tenure and housing satisfaction. The other parts of the questionnaire consisted of questions about the evaluation of the urban environment in term of transport, social ties, facilities and mixed uses.

The questionnaire was randomly distributed to people in two settings Edinburgh and Ottawa. Correlation Analysis (used to find associations between two variables) and Factorial Analysis (refers to a variety of statistical techniques whose common objective is to represent a set of variables in terms of a smaller number of hypothetical variables) were the main methods used to analysis of the questionnaire. The next chapter analyses the questionnaire that has been distributed in Edinburgh and Ottawa.

Chapter 6

Analysis

CHAPTER 6
ANALYSIS

6.1-Introduction

This section aims at analysing the two settings, Edinburgh and Ottawa. The first part of the analysis is concerned with general questions: age groups, gender, home ownership and house type. These questions elicit a general understanding of the two samples. The questionnaire consists of questions which help to classify the answers statistically based on five points scale (see Chapter 5). The second part of the analysis concerns the evaluation of the respondents concerning their homes and neighbourhoods.

6.2-Gender

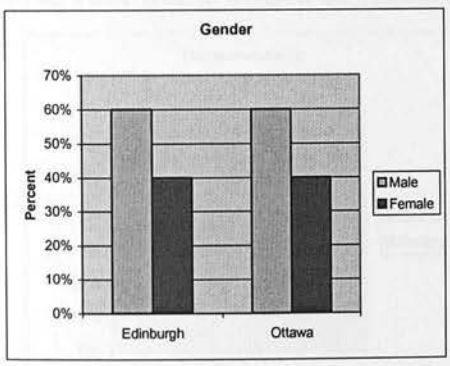


Figure 6.1 Gender

The gender of the interviewees in both samples is closely balanced. Men were the main representatives in both surveys. The sex distribution in this survey was 33 male (60% of the total sample) and 22 female (40% of the total sample) for Edinburgh and 22 male (60%), 15 female (40%) for the Ottawa sample.

6.3-Age Group

Q: Age of the interviewees

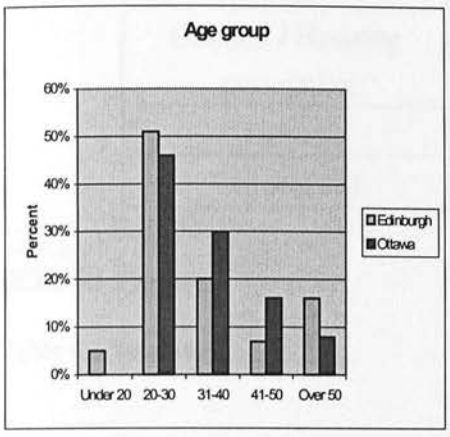


Figure 6.2 Age Group

The respective ages of the interviewees in both samples are very similar. The 20-30 age group was the most representative in both cases, followed by the 31-40 age group. The similarity of the ages of the interviewees has the effect of harmonising the samples. At the same time the diversity of the ages of the interviewees helps to ensure a wide range of participants. This means that satisfaction and perception, having been measured within different age groups are more representative of the population of the sample see (Figure 6.4).

6.4-Home Ownership

Q: Is your home owned or rented?

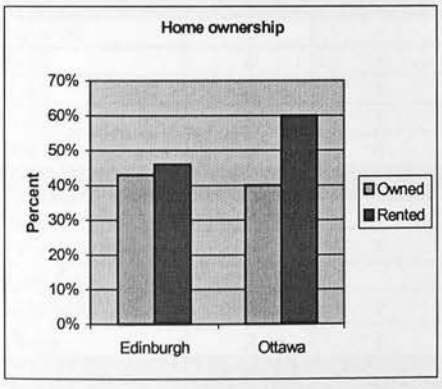


Figure 6.3 Home Ownership

The ownership of the properties in which the individuals within both samples lived was relatively similar. Men were slightly more likely to own than were women (13 compared with 11 in Edinburgh). This was similar to Ottawa, where men were far more likely to own than were women (11 compared with 3) see (Table 6.2)

Renting was most common among the younger age groups (19 persons of the 20-30 age group rent compared with only 1 person of the 41-50 group).

Tenure	Frequency		Percent	
Owned	24	15	43%	40%
Rented	26	22	47%	60%
Council / Housing association	3	-	3%	-
Others	1	-	2%	-
Unrecorded	1	-	2%	-

Edinburgh

Ottawa

Table 6.1 Tenancy

More than 47% of the households in Edinburgh rented their homes and 43 % of the households owned them. In Ottawa 60% of the households were in rented accommodation and 40% of the households were owner occupied. These results show a higher percentage of rentals than ownership as shown in **Table 6.1**.

Variables	Owner occupier		Renter		Total	
	Edinburgh	Ottawa	Edinburgh	Ottawa	Edinburgh	Ottawa
Gender						
Male	**13**	**11**	17	11	30	22
Female	11	3	9	12	20	15
Age						
Under 20	3	-	-	-	3	-
20-30	6	5	**19**	**16**	25	21
31-40	6	2	4	5	10	7
41-50	3	3	1	2	4	5
Over 50	6	4	2	-	8	4
Housing type						
Tenement flat	9	1	**21**	**22**	30	23
Semi-detached	8	1	1	-	9	1
Other flat	3		2	-	5	-
Detached	2	9	1	-	3	9
Others	2	3		1	2	4
Plan to move home						
Plan to move	14	3	11	10	25	13
No plan to move	10	11	13	13	23	24

Table 6.2 Analysis of main sample by current tenure

Home ownership could be seen as contributor towards sustainability. Giving the chance to own a home could encourage people to take care more about their environment, and to look after their neighbourhood.

6.5-Occupation Patterns

Q: Occupation patterns of interviewees

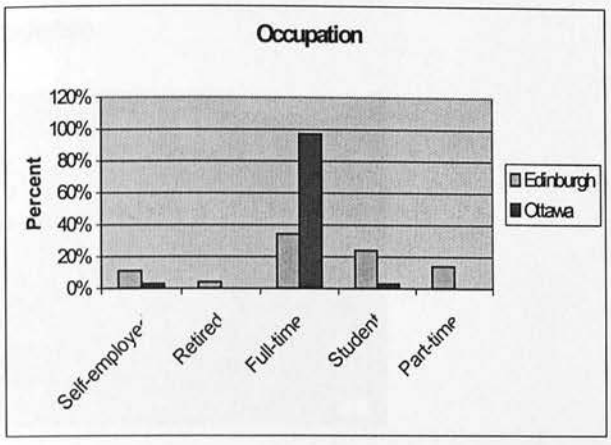


Figure 6.4 Occupation

The occupations of those interviewed in Edinburgh were different from those of the sample in Ottawa. People in full-time work make up the dominant occupation pattern in both samples. More than 30% (19) of the respondents were full time employees, and more than 20% were students in the case of Edinburgh. Being a student was the second main occupation in Edinburgh, which was mainly related to the number of universities (principally Edinburgh University, Heriot-watt University and Napier University). **Figure 6.4** shows the diversity of occupations in Edinburgh as well in Ottawa which was characterised by a high representation of full-time employees.

6.6-HouseType

Q: What is your house type?

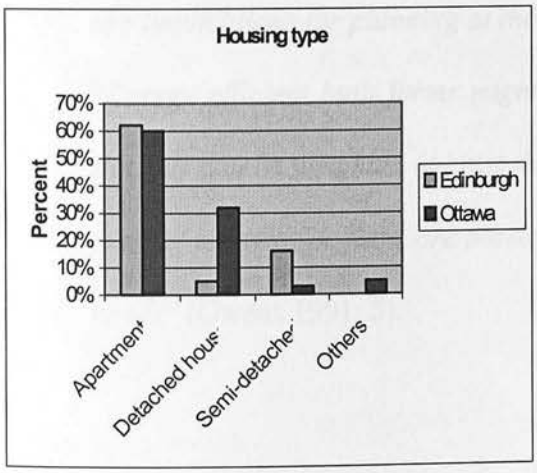


Figure 6.5 Housing type

It is notable that certain house types and house sizes were mainly found in the rented accommodation.

This variable is intended to explore the housing type in which samples were living. The chart in **(Figure 6.5)** shows a difference between the two samples. Apartment (tenement/flat) type was the

most common response in the survey. People in Ottawa tend to live in detached houses contrary to Edinburgh's survey, where semi detached house was the second main response.

Figure 6.6 Apartment flat in Edinburgh (The author 00)

Figure 6.7 a semi-detached house in Edinburgh (The author 00)

House type could have an impact on energy and on sustainability. Susan Owens (1991) suggests that the built form exert a systematic influence on energy requirement for space heating. She also adds that detached houses can require as much as three times the energy input of equivalent intermediate flats. She continues on saying:

> "*There can be little doubt that any systematic trends towards built forms like terraced housing or low rise flats could result in significant reductions in energy demand. Since such a trend would imply generally higher net densities, there are implications for planning at the urban scale*
>
> "*Energy efficient built forms might also incur costs in term of loss of amenity. But this can be weighted against the fact that smaller housing units, often in the form of terraces or flats, are particularly suited to meeting projected household needs*" (Owens 1991: 5).

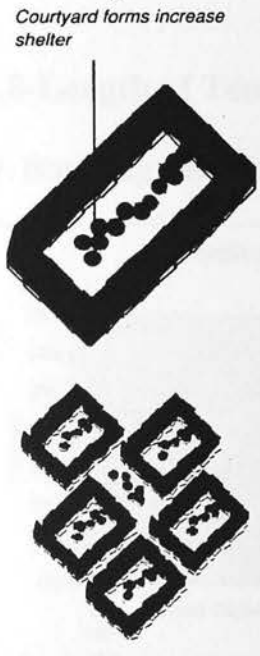
Figure 6.8 Apartment flats in Ottawa (The author 00)

Figure 6.9 Semi-detached houses in Ottawa (The author 00)

Approaches to better and sustainable housing should include considerations about the house type and layout. Attached house types could be seen as more efficient in their energy consumption than detached houses as Rydin suggests:

> "*Detached houses are more inefficient in their energy consumption than attached forms of dwellings such as terraces and flats*" (quoted in Haughton 1994: 109).

Layout



Layout considerations such as designing houses to capture solar energy in winter months and to provide cool shaded spaces in summer months. Courtyard designs can be used in cool climates to capture heat, and in warm climates to provide shade, reducing the need for air conditioning. Well-designed courtyards can also provide an attractive communal space, safe for children to play in and conducive for adults to meet in. Additionally, the internal design and equipping of housing can be made conducive to environmentally sensitive behaviour such as providing space for bikes in garages (Haughton 1994).

6.7- Choice of Residence

Q: Why do you choose to live here?

This variable is intended to explore why the sample chose to live in their environment. Responses seemed to be polarised around two reasons: 'good in price', which covers economic factors and 'like the place'.

Choice of residence	Count		Percent	
Because of work	8	7	15 %	19 %
Like the place	17	10	**31%**	**27%**
Family always lived here	6	4	11%	11%
Good in price	16	15	**29%**	**40%**
Others	7	-	13%	-

Edinburgh
Ottawa

Table 6.3 Choice of living in Edinburgh and Ottawa

The choice of living place was chosen from criteria such as economy (good in price) and because of they like the place, which represented the major answers.

6.8-Length of Tenure

Q: How long have you lived at your present address?

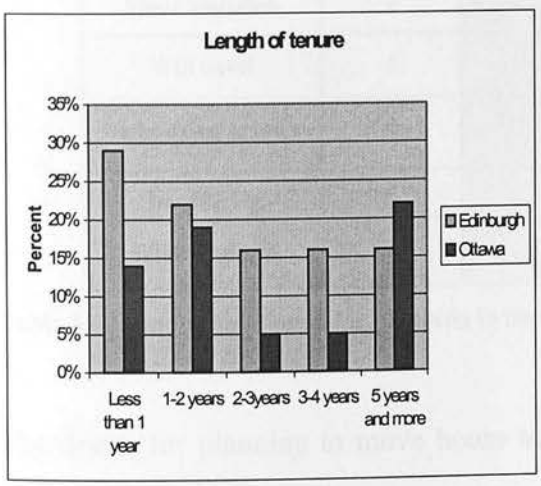


Figure 6.10 Length of tenure

This variable aim at finding out the length of time the respondents have lived in their respective homes. This variable shows statistical significance in Edinburgh, where the majority of the respondents had barely spent one year in their home, contrary to Ottawa, where the majority had spent 5 years or more at the same place.

6.9-Plan to Move Home

Q: Are you planning to move home?

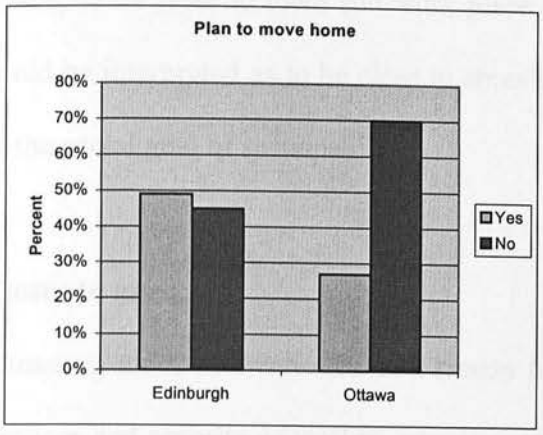


Figure 6.11 Plan to move home

This variable aims to arrive at understanding if the interviewees are intended or planning to change their residency.

Half of the interviewees in Edinburgh intended to move home mainly to downsize. **Table 6.4** shows the main reasons, which can be characterised a levels of rent may generate Economic or Spatial. As the rent is probably high, people in Edinburgh have a high likelihood to move this could contribute in sustainability, promoting affordable houses will also contribute to the economic goal (see Chapter 1). The main reasons for planning to move home was found in the coming section.

6.9.1-Reasons mentioned for planning to move home

	Edinburgh	Ottawa		Edinburgh	Ottawa
Space limitation	6	-	Because of work		3
Will travel	5	-	End of lease	-	1
To be closer to town	4	-	Cheaper	-	1
Downsizing	2	-			
When graduate	2	-			

Table 6.4 Reasons mentioned for planning to move home

The desire for planning to move house because of 'space limitation' proved to be the most important single reason for moving given by respondents in Edinburgh. Personal reasons, i.e. travel or graduating were also given. The desire for planning to move

"because of work" is given as a reason for moving by respondents in Ottawa this could be interpreted as desire of respondent in Ottawa to move closer to their work place. Space, to be close to town and work place contribute to sustainability. 'Close to town' could be interpreted as to be close to amenities, shops and people and it is contributing to the social goal of sustainability.

Closer to town

'Closer to town' is mentioned as a reason for planning to move home. Town provides services and security as well as amenities to people which live nearby. It refers also to high concentration of activities and buildings.

Work

'Because of work' is mentioned in Ottawa as a reason for planning to move home. People move home in order to be closer to their place of work. This notion will be elaborated more in detail in the coming sections.

6.10- House Satisfaction

Q: How satisfied or dissatisfied do you feel about your home?

Figure 6.12 Typical residences in Edinburgh (The author 00)

Figure 6.13 Typical residences in Ottawa (The author 00)

This variable aims to arrive at an overall satisfaction variable for both samples of their home. It is presented on a five-point scale of satisfaction (nominal scale). The vast majority in Edinburgh (60 percent of the main sample) surveyed were fairly satisfied with their present accommodation, with less than 2 percent being fairly dissatisfied. Further analysis will be made of how differences in tenure and in age can influence views on satisfaction and also on home value. Many reasons were given for home satisfaction as we can see in the following paragraphs.

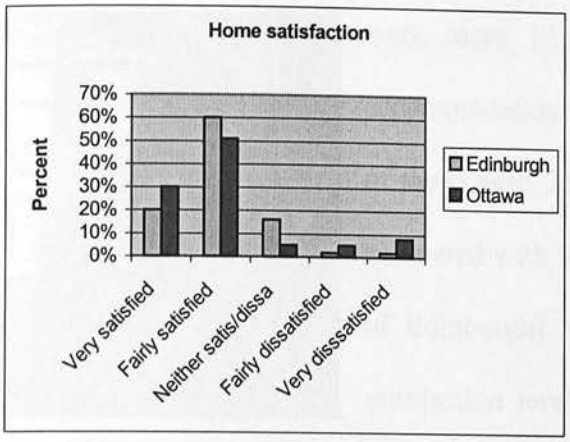


Figure 6.14 Housing satisfaction

Variables	Very satisfied		Fairly satisfied		Neither satisfied or dissatisfied		Fairly dissatisfied		Very dissatisfied	
Gender										
Male	7	9	18	11	7	-	1	2	-	-
Female	4	3	15	6	2	4	-	2	1	-
Age										
Under 20	1	-		-	2	-	-	-	-	-
20-30	5	7	19	8	3	4	1	2		
31-40	2	1	6	4	3			2		
41-50		3	3	2					1	
Over 50	3	1	5	3	1					
Housing type										
Tenement Flat	6	7	**23**	8	4		1			
Semi-detached house	3		3	1	2				1	
Other flat	1		4	7	1					
Detached house	1	2	2	1						
Others		3	1	-	1					
Ownership										
Owned	7	5	11	9	5					
Rented	2	7	**20**	8	3	4	1			
Council/housing association	1		1		1					
Others			1							
Plan to move home										
Yes plan to move	4	1	15	8	7				1	
No plan to move	7	**11**	15	9	2	4	1			

Table 6.5 Analysis of main sample by level of satisfaction

This overall level of satisfaction does, however, mask some interesting tenure-based variations. From **Table 6.5** it is clear that tenants were more satisfied with their accommodations than owners, which may be due to the higher level of renter in the

survey. Overall satisfaction also varied slightly by age. Those in the 20-30 age group were more likely to be satisfied with their present accommodation than were older respondents (19 persons of those aged 20-30 were fairly satisfied in their housing compared with 5 persons of those of older age in the case of Edinburgh). Given the tenure-based variation in the satisfaction levels noted above, it is likely that this age-based difference reflected in part the relatively high proportion of young people in the rented sector.

Figure 6.15 A housing type in Ottawa (The author 00)

When satisfaction levels are analysed by household type it emerges that elderly households tended to be less satisfied with their housing; on average young households tended to be more satisfied.

Both samples were asked to assess their satisfaction with the house type, it emerges from the survey that the vast majority of the people surveyed from Edinburgh and Ottawa were fairly satisfied with the tenement flat. The chart in figure 6.5 shows the difference in house type. Apartment flat was the most representative for the two samples in second position was followed by the semi-detached house mainly dominant for the case of Ottawa where the interviewees shows a satisfactions with this type of house. As described in section 6.6 house type have an impact on energy and sustainability, attached houses type could be seen as more efficient in term of energy consumption that detached houses (see previous section).

6.11-House Location

Q: How satisfied or dissatisfied do you feel about your house location?

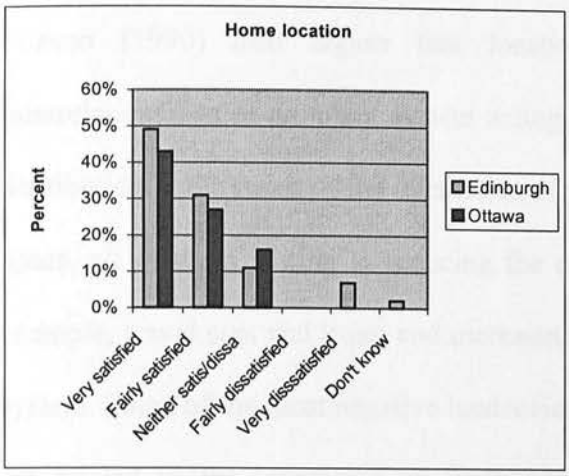


Figure 6.16 Home location

All respondents were asked to assess their satisfaction with various aspects of their property. House location was one of the attributes frequently mentioned. Respondents interpreted location as referring to areas close to the town centres where many facilities and different activities, such as colleges, shops and schools, were found. This variable is highly significant. People's home satisfaction was highly related to their satisfaction to the home location as can be seen in the Correlation and Factor Analyses (Chapter 8).

Location is related to sustainability and to urban systems. The distribution of different activities in the city and their locations could have significant impact on distance energy. The coming section emphasises on the distribution in space.

Distribution in space

Lozano (1990) argues that "*distribution reflects the location of sets of finite elements in geographic space, that is the location of activities, population, and facilities to specific sites and the resulting spatial organisation of urban systems, whether metropolises or neighbourhood* " (Lozano 1990: 185). Understanding each element separately does not give a global picture how they are linked as he adds: "*one cannot understand an urban*

system simply through knowledge of each of the component elements separately"(ibid: 185).

Lozano (1990) also argues that location determines the specific effect and interrelationships of an urban system acting upon a particular site. He adds that urban distribution is the result of the interaction of people and activities in concentrated urban space, all of them aiming at reducing the cost and time of overcoming distance (for example, travel cost and time) and increasing the advantages of their roles in the urban system. Some of the most negative tendencies of cities, particularly in the United States, are related to the increasing unravelling of urban distribution. Loosely distributed locations, reflected in the dispersion of population and employment and the creation of dispersed centres results in wasted resources.

Dispersed distribution has serious implications for energy and environmental conservation. Because mass transit cannot be extended to dispersed residential or employment areas, transportation is provided largely by private cars, which consume huge amounts of energy and are main contributors to air pollution.

Accessibility plays a critical role in the distribution of urban elements. On the metropolitan scale, a key factor is the location of basic employment, which influences the location of other elements. The relationship between employment and residential areas is established through the urban transportation system. Residential location usually follows employment. People who cannot afford expensive trips and frequently change jobs, locate near employment centres.

6.12-Building Materials

Q: How satisfied or dissatisfied do you feel about your house materials?

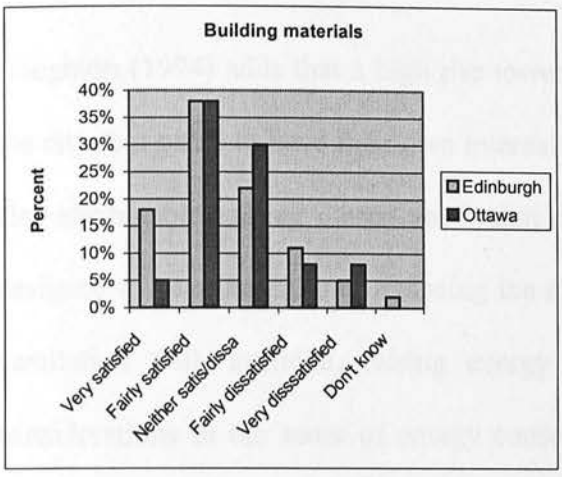


Figure 6.17 Building material

This variable is intended to measure people's satisfaction with the building material. Most responses, 38% in Ottawa were 'fairly satisfied' similar to people in Edinburgh in which 38% of the interviewees were 'fairly satisfied'. The coming section elaborate on the use of appropriate material could contribute to sustainability.

Bad buildings and designing against nature

In Europe and North America the tower block and the housing estate have come to be regarded as the antithesis of good design. They have come to represent sealed buildings in sealed areas, denying permeability in terms of both natural and social environments. Richard Sennett adds: "*Faced with the fact of social hostility in the city, the planner's impulse in the real world is to seal off conflicting or dissonant sides, to build internal walls rather than permeable borders. Highways and automobile traffic, for instance, are used to subdivide different social territories in the city...Similarly, functional dissagregation has become a technique for sealing borders; the shopping mall that is far from tracts of housing, the school on its own campus, the factory hidden in an industrial parks*" (quoted in Haughton 1994: 106).

It is not just that the buildings were poorly designed, but the spaces in which they were located were poorly designed, too. Cities not only became more divided, socially and

economically, but neighbourhoods within them became monofunctional and monocultural (Ibid).

Haughton (1994) adds that a high rise towers not only changed local microclimates in the city, but came to have their own internal microclimates of hot spots and cold spots, also attributable to their closed ventilation and heating systems. These buildings were designed to keep nature out, replacing the natural sunlight with artificial light, natural ventilation with artificial, raising energy requirement enormously. Environmental considerations in the sense of energy conservation have gradually begun to be taken more seriously in housing and office design in recent years. In the UK it is estimated that 50% of CO^2 emissions are from buildings, 60% of which is attributable to housing. There is reportedly scope for reducing these emissions by around 35% from better-built and better-designed buildings and using more efficient household equipment (Ibid).

Approaches to better buildings can include energy efficiency in equipping house, such as walls and loft insulation, draughtproofing and provision of solar panels for heating, choosing materials which are less energy-intensive to manufacture, and recycling building materials.

Use of appropriate technologies and materials

Technological solutions to environmental problems too often tend to work against nature, to be more expensive than they need to be and to create work as the preserve of a scientific elite by creating products which ordinary people cannot understand or service themselves. Schumacher provides a widely read commentary in which he argues that large businesses and state organisations combine with the functional specialisation

of mass production to create massive economic inefficiency, inhumane working conditions and environmental pollution (Haughton 1994).

The energy input required to quarry, transport and manufacture building materials, plus the energy used in the construction process, can amount to a quarter of the lifetime energy requirement of a very energy efficient building. To reuse embodied energy[1] advocates of sustainability suggest:

- 'Re-use existing buildings and structures;
- Construct buildings and infrastructure out of local and low-energy materials;
- Design buildings for long life, with ease of maintenance and adaptability for changing needs' (Hugh Barton, 1996: 17).

In the urban context, the call for greater use of appropriate technologies, materials and design is common to many cities. This can be seen in the calls for 'sympathetic' development in English cities by critics such as Prince Charles, who favours a return to classical principles of architectures and more traditional building materials. In addition, nature needs to be designed into rather than out of the development process. This concept is as true of urban development as it is more generally. Many of the contemporary ills of cities stem from attempts to create artificial environments, both on the level of the whole neighbourhood and of the individual home and office (Haughton 1994).

[1] The working definition of embodied energy is "*The energy content involved in the extraction, manufacture, transportation, construction and demolition of materials, products and assemblies in buildings*" (Unpublished Paper Presented by The Robert Gordon University 1996).

Use materials with recycled content

Specifying materials with high-recycled content not only reduces the amount of new material, energy and pollution in their production, it reduces the need for landfills, and possible pollution from incineration. Many materials and components are now available that have recycled or 'waste' - product content. These range from concrete that uses fly ash aggregate, carpets made from recycled soda bottles and insulation made from recycled paper, to paints that contain post-consumer returns. Designers should pay particular attention to the recycled contents of building materials derived from scarce non-renewable resources, such as:

- increasingly scarce metals: copper, lead, zinc, tin, steel and aluminium,
- plastics made from petroleum products rather than cellulose,
- Other materials such as concrete, requiring large amounts of petroleum energy for production.

These should be selected with as high a recycled content as possible, and limited to applications where they contribute to sustaining the environment and to the overall longevity of the building, have no economical substitutes, or are designed for reuse/recyclability. However, the availability of products with recycled content is dependent on demand by specifiers. Architects and designers can help ensure that innovative products with greater recycled content are available by making this a visible priority in their material specifications and requesting information on recycled. In summary sustainability take into consideration materials, which are less pollutive to the environment and easy to recycle and to reuse.

Use of local materials and skills

The use of local materials is an important element in the movement towards a more sustainable construction sector, because by doing this it also becomes possible to fulfil

other objectives. The phrase "think globally, act locally" has become a motto in the environmental movement, its use continues the best way to solve global problems through local action.

Fairlie gives three reasons as to why the use of local materials should be encouraged: they are easily *accessible*, easily *accountable* and easily *assimilable*. Firstly, because of their accessibility, builders can avoid bringing materials great distances, which therefore reduces pressure on roads and cuts carbon dioxide emissions. Secondly, local materials are accountable (Maf 1998).

> "*In the modern building world, we use bricks from the other side of the country, or even from across Europe, aggregates from superquarries in remote rural areas, and wood from half a world away. We buy products from around the world simply because they are all that is available at the builder's merchants or at our local out-of-town...In buying such products, however, we have no knowledge about how materials are extracted and processed or how employees are treated. In short, materials are likely to be grossly unsustainable. Furthermore, because materials come from half a world away, our awareness of their scarcity is practically nil, because we do not see the effect of their production"*(Maf, S 1998: 80).

Reliances upon local resources for materials, would ensure more responsible use and encourage people to use a wider range of materials such as straw, recycled paper insulation or earth. It would lead to more responsible use (Ibid).

> *" It is important that people experience / appreciate the impact of their own expansions. It is more likely then that things are kept in proportion, that materials are regarded as precious, and appropriate use is made of them, rather than, for example, the grinding down of good building freestone for road ballast*" (Maf, S 1998: 80).

> "*Traditional buildings styles developed by finding inspired solutions to problems that arose through access to only a limited range of materials. Modern architects, with literally thousands of building materials and products at their fingertips, instead paste...detail over a non- existent problem. If we are to rediscover an architecture that is dynamic yet remains authentically traditional, then we can only do so by giving builders free rein to solve fundamental problems with a similarly limited, but updated, range of basic local materials"*
>
> (Maf 1998: 82)

Vernacular architecture has become cherished by planners as they attempt to make modern buildings 'fit in'. The problem in doing this, is that traditional construction had no concept of planning consent.

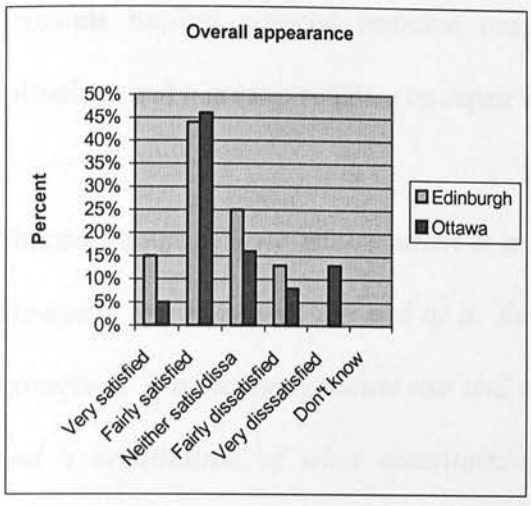
As Fairlie notes:

> "*For over 20 years, the planning profession... has tried to recreate artificially, usually with ghastly results, the architectural integrity that was natural in pre-industrial buildings"*(quoted in Maf 1998: 82).

This vernacular approach also had lower environmental impact than modern day activities.

6.13-Overall Appearance

Q: How satisfied or dissatisfied do you feel about the overall appearance of your house?



The aesthetic appearance of the home is a variable directed towards evaluating appreciation of homes in terms of design and use of materials. 44% in Edinburgh and 46% of the interviewees in Ottawa were fairly satisfied with the overall appearance.

Figure 6.18 Overall appearance

6.14-Implementing Sustainability at Home

Q: How do you implement sustainability at home?

This question aims to identify measures of implementing sustainability at home. Interviewees identified two main methods: economic and environmental. Economic measures include turning off lights, restricting heating by timing and avoiding waste of energy. Environmental measures included: recycling and reusing. 38% of interviewees from Ottawa showed a high level of responses regarding recycling and reusing, in contrast to the sample of Edinburgh where only 15% implement recycling and reusing. 22% of the interviewees in Ottawa avoided waste of energy composed to only 5 % in the case of Edinburgh.

From this one can conclude that people in Ottawa were more aware about environmental and economical measures to sustainability. The following section is a discussion on minimising waste, recycling and reusing measures.

Minimising waste, recycling and reusing

Minimising waste means reducing the usage of resources and reducing waste outputs to the environment from households and industry. The minimisation of human resource demands implies reduced resource use, the maximisation of reuse and recycling initiatives and a greater reliance on repair rather than replacement (Haughton 1994).

Simpson notes "*Waste minimisation is a principle to be applied to the whole product life-cycle, not merely at the end of it. Targets are thus to be applied to raw material extraction, production, product use and disposal, which require technology, planning and a redefinition of what constitutes good house- keeping practices*" (quoted in Haughton 1994).

The principle of minimising waste requires a wide range of initiatives, including increasing the life of products, cutting out unnecessary car journeys, eliminating the over-packaging of goods in shops and reducing and reusing the waste heat of large power stations (Haughton: 208). Increased energy efficiency in homes, offices and factories has the potential to lower significantly the consumption of fossil fuels, reducing the need to build new power stations, with all the attendant financial and environmental costs of construction and operation (ibid 209).

Minimising waste requires the development and implementation of technologies which reduce waste, whether this is with reference to power generation or in industry. Ideally, however, waste minimisation should be achieved by preventative means (prevention is better than cure).

Recycling is another way for minimising waste as Morris adds:

" *The best form of recycling occurs when re-use the original product. Refillable bottles, cloth diapers, refurbished appliances save virtually 100 percent of the energy, pollution, and materials required to make them in the first place- and the savings multiply with each reuse. Recycling materials into their original form is a second- best strategy. Recycling glass into glass, or newsprint, saves 20 to 95 percent of the energy, water, mining wastes, and air pollution consumed or produc3ed to process the product from virgin materials. The worst form of recycling transforms a material into a secondary form. Glass into 'glassphalt' for roads, paper into compost, plastic bottles into park benches do little to avoid the need to extract new materials and thus do little to reduce pollution"* (quoted in Roseland, M 1992: 174).

Roseland (1992) suggests that there are twelve master categories for recycling:

1-*Reusable goods*, including but not limited to intact or repairable home or industrial appliances; household goods; clothing; intact materials in demolition debris; building materials such as doors, windows, cabinets, and sinks; business supplies and equipment; lighting fixtures; and any manufactured item or naturally occurring object that can be repaired or used again as is.

2-*Paper*, including but not limited to newsprint; computer paper; corrugated cardboard; and mixed paper.

3- *Metals*, both ferrous and non-ferrous; including but not limited to cans; parts from abandoned vehicles; plumbing; fences; metal doors and screens; and any other discarded metal objects.

4- *Glass*, including but not limited to glass containers and window glass.

5- *Textiles*, including but not limited to nonreusable clothing; and pieces of fabric.

6- *Plastics*, including beverage containers; plastic packaging

7- *Plant debris,* including but not limited to leaves and cuttings, trimmings from trees, shrubs and grass.

8- *Putrescribles,* including garbage, animal, fruit and vegetable debris.

9- *Wood*, including but not limited to non reusable lumber and pallets.

10- *Ceramics,* including rock, ceramic, brick and concrete.

11- *Soils,* including but not limited to excavation soils from barren or developed land and excess soil from yard.

12- *Chemicals*

Use Alternative Energy Sources

The use of alternative energy sources to meet domestic energy demands is an urban goal that satisfies the environmental aspects of sustainability. Methods of achieving this are many and varied according to local resources and technological availability. Carmona lists the energy goals of urban design as:

-Use of passive solar energy through design, orientation and layout;

-Use renewable energy sources e.g. solar, hydro, wind, etc;

-Encourage use of natural light;

-Encourage use of natural ventilation;

-Encourage energy conservation;

-Prevention of heat loss.

In building design it is not invariably true to state that use of alternative energy relies on advanced technology, because the effective use of natural light and air ventilation relies on the skills of an architect or designer sensitive to their benefits. Traditionally, uses of natural light and ventilation have effectively been used in buildings all over the world. This makes the reuse of old methods an easier task. Technological advances have however created ever more effective methods of the use of alternative energies, such as;

wind, sun and hydroelectric power. These coupled with effective design can cause significant impact on domestic use of energy (Roseland 1992).

6.15-Home Re-selection

Q: if you had the choice to re-select your residential area, which of the following conditions would be of the greatest priority in your consideration? Write by order from 1 to 8.

	Number1		Number2		Number3		Number4		Number5	
Close to the city	21	8	6	1	5	6	-	-	4	-
Close to the work place	13	13	6	1	6	5	4	3	-	-
Close to parks	2	3	2	3	3	3	5	3	5	4
Close to good school	2	3	-	4	-	1	2	2	1	2
Better neighbour	4	-	1	4	3	3	4	2	4	4
Proximity to public transport	6	-	4	1	5	-	3	-	5	-
Country side	11	6	1	-	1	-	4	-	3	-
Close to friend	8	-	6	-	5	-	2	3	-	-

Edinburgh

Ottawa

Table 6.6 Home re-selection

People were asked to re-select their home, by order of priority from one to five **(See Table 6.6)**.

Interviewees from Edinburgh indicated being close to city centre as a number one factor in re-selection. The second factor is being close to the work place and the third factor in re-selection is proximity to public transport.

On the contrary the vast majority of the interviewees in Ottawa indicated 'close to work place' as a number one factor for re-selection, the second factor being equally closer to a good school and better neighbours, the third factor being proximity to the city.

Close to city

Being close to city refers to concentration of use, activities and buildings. The city centre being at the heart of a city where can find commercial to institutional services as well as recreational facilities because of its location and well served by transport network. It is also easy to reach either by walking or by public transport.

Close to work place

Similar to be close to city, close to work place could contribute to sustainability. It reduces distance to work as well as use of the car as a mode of transport which has negative impact on the environment. It could also contribute into the urban form; this notion will be addressed thoroughly in the coming sections.

Proximity to public transport

Being close to public transport will provide easy access to facilities and work place. Public transport contributes into sustaining the urban environment. Public transport is also seen as a measure for restricting the use of car, for instance buses produces less carbon dioxide than cars (Friends of the Earth 1991).

Variables	Edinburgh	Ottawa
House quality	(60%)	(52%)
House location	(50%)	(43%)
Building material	(38%)	(38%)
Overall appearance	(44%)	(46%)

Table 6.7 Mean evaluation of samples for housing satisfaction

The table above summarises the variables assessed by people in both cities which relate to the quality of the house. In this case a much larger number of variables are statistically significant.

Satisfaction for those chosen variables of home satisfaction are listed in **Table 6.7**. Not all variables above showed statistical significance. Overall satisfaction with appearance is shown to be higher in Ottawa 46% than in Edinburgh 44%. The researcher can conclude that these variables contribute to sustainability and urban systems.

	Very satisfied		Fairly satisfied		Neither satisfied or dissatisfied		Fairly dissatisfied		Very dissatisfied	
Home quality										
Count	11	11	33	19	9	2	1	2	1	3
%	20 %	30 %	60 %	51 %	16 %	5 %	2 %	5 %	2 %	8 %
House location										
Count	27	16	17	10	6	6	4	-	1	-
%	**49 %**	43 %	31 %	27 %	10 %	16 %	7 %	-	2 %	-
Building materials										
Count	10	2	21	14	12	11	6	3	3	3
%	**18 %**	5 %	38 %	38 %	22 %	30 %	11 %	8 %	5 %	8 %
Overall appearance										
Count	8	2	24	17	14	6	7	3	-	5
%	**14 %**	5 %	44 %	46 %	25 %	16 %	12 %	8 %	-	13 %

Edinburgh

Ottawa

Table 6.8 Housing satisfaction for Edinburgh and Ottawa

6.16-Summary

In summary, most of the respondents in Edinburgh have chosen their residence for two main reasons: because they liked the place (31%) and because the price was good (29%). Similar reasons are to be found for the sample of Ottawa where 27% liked the place and 40% felt it was good in price.

Both samples were satisfied with their residence. House quality in term of house location, spaciousness, material and the overall appearance were also appreciated. Quality of location refers to situations close to town centres. Samples from Edinburgh have shown a higher response related to location compared to Ottawa.

Samples from Edinburgh and Ottawa were asked to assess the possibility of reselecting their home. The majority of the interviewees in Edinburgh showed a desire to reselect their home *close to city centre* or secondly close to the *work place.* On the contrary the vast majority of the interviewees in Ottawa indicated *proximity to work* place as the number one factor followed by being *close to a good school* as the second factor.

The first part concentrates on an evaluation of perceptions of home satisfaction; the following part evaluates people's perception of their neighbourhood. The satisfaction of both samples is assessed upon their transport, social interactions (relationships with neighbours, relatives and friends) and overall satisfaction with the neighbourhood.

6.17-Neighbourhood Satisfaction

Q: How satisfied or dissatisfied do you feel about your neighbourhood?

Figure 6.19 A neighbourhood in Edinburgh (The author 00)

Figure 6.20 A neighbourhood in Ottawa (The author 00)

This variable evaluates the overall satisfaction of the samples in terms of perception of their neighbourhood environment. It shows a statistical significance indicating that the results in the chart below are reliable.

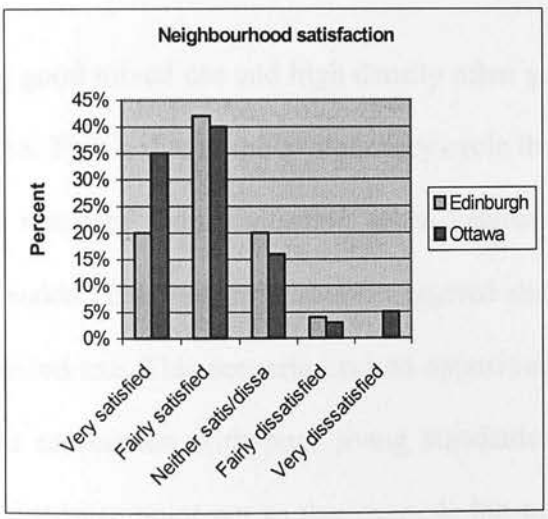


Figure 6.21 Neighbourhood Satisfaction

The samples in Ottawa and in Edinburgh were very satisfied with their neighbourhood. Almost 45 % of the total samples in Edinburgh were fairly satisfied and only 42 % of the interviewees in Ottawa were fairly satisfied. The following factors are means towards evaluating the neighbourhood environment each on a five-point scale of 1 to 5.

6.18-Mixed Use

Q: How satisfied or dissatisfied do you feel about mixed use in your neighbourhood?

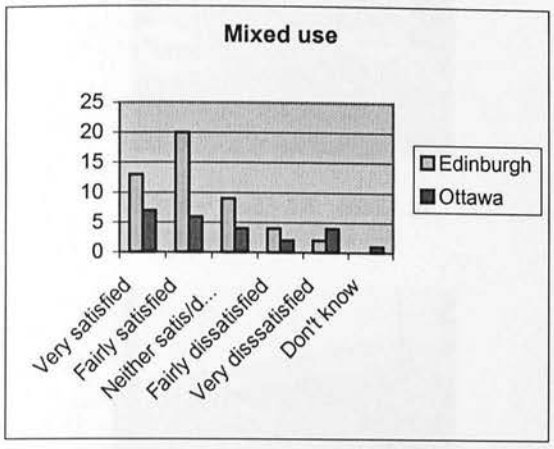


Figure 6.22 Mixed use

This variable is not intended to quantify mixed use in the two case studies, because this can be done though on-site observation. It is meant instead to measure the two samples' preferences for mixed use. The Edinburgh sample, through observation, is more appreciative of mixed use than in Ottawa. This variable proved to be statistically significant see Figure 6.22.

A good mixed use and high density often go together as do sprawl and homogeneity of use. This is due to the evolutionary cycle that many urban forms have gone through. As a result of industrialisation urban centres grew in size to accommodate the labour needed. This industrialisation triggered shanty-towns where there is high density and mixed use. This scenario created opposition to high density and mixed use because of its association with poor living standards. However, advocates of high density and mixed-use point not to this example but to the formation of relative high density and mixed use areas typical of traditional urban environments. High density living and mixed-use achieve some social goals in that they create an urban vitality and promote social cohesion to some extent (Jane Jacobs 1961), in addition to increasing availability of time for social activities and community interaction.

Figure 6.23 A mall in Ottawa (The author 00)

Figure 6.24 Parking space in a mall in Ottawa (The author 00)

Figure 6.25 A shopping centre in Ottawa (The author 00)

Figure 6.26 The market place in Ottawa (The author 00)

The way economic activity is structured within the urban fabric affects a number of things among which are transport distances. Diverse forms of economic activity constitute the major part of any built environment. The distribution of these activities within the urban form is a determinant of the physical characteristics of the settlement. They determine home/work relationship, home services relationship and homogeneity or diversity of the urban landscape in terms of uses.

Mixed land use has become a sought after quality as a consequence of the environmental impacts of segregation and the use of zoning laws. Such impacts include physical or aesthetic deficiencies. The most important physical deficiency is over-dependence on transport. This directly pollutes natural and urban environments as well as putting great demands on world energy resources. It is these physical effects that led environmental movements to seek mixed land uses. Increased health risks through

pollution, loss of time and effort are manifestations of commuting distances. At the same time a decline in the quality of urban life can be linked to homogeneity of land use. Urban form has become aesthetically monotonous and social life has lost vitality because of the loss of a multitude of diverse experiences when previously a larger number of activities were found in an urban environment. Segregation and uniformity have affected both the social and physical characteristics of the built environment.

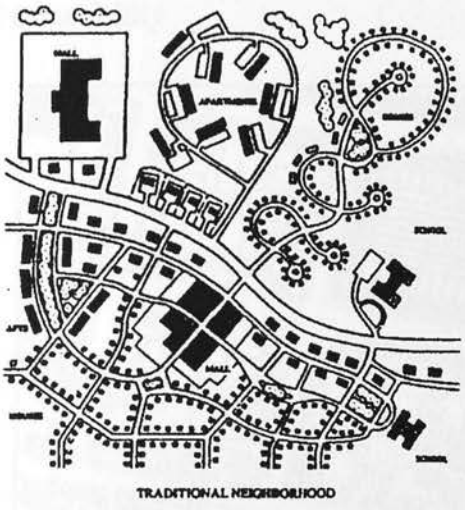


Figure 6.27 a representation of a suburban sprawl (Murrain, P 1996: 87).

Uniformity and segregation are not only a result of zoning by laws, but also of a need portrayed by current forms of activity as identified in large business. Prevailing trends towards large-scale activities have also promoted uniformity. Commercial activities for example, instead of having the ability to become more evenly dispersed throughout the urban environment as seen in small shops, have become centralised with the advent of the superstore. Factories have likewise replaced small shops.

Edwardo Lozano is among a number of writers who have opposed homogeneity in urban landscape. He argues that "*Land use is the single most basic variable determining the form of a community*" (Lozano, E 1990: 131). He describes urban development as being the result of the contemporary phenomenon of specialisation and well-defined single-use areas. Planners and urban designers must learn to strike the correct balance between segregation of hazardous land uses and structuring uses in their settlements to

enhance social life. They must not confuse a machine using society with a vision of society as a machine in itself (Mumford 1966).

Good mixed use

The challenge to achieve this in physical terms are two fundamental qualities necessary: permeability and variety (Murrain, P 1996: 86).

Permeability

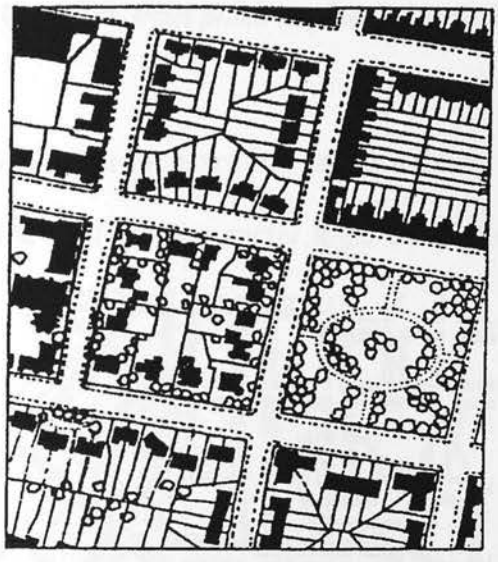


Figure 6.28 The perimeter block (Murrain, P 1996: 87)

Murrain (1996) argues that permeability is the basis for any democratic sustainable urban layout simply because if you cannot reach a place you cannot use it. He adds: "*Contrary to popular belief, this does not deny privacy nor does it deny restricted access to things that may legitimately benefit from relative security. That is possible through the management of the grid; for it is the grid town that affords the potential of choice and change... The connecting of the grid should be consistent through a variety of scales down to the finest grain to allow perimeter blocks of development to exist with clear distinguishable public and private sides* " (Murrain, P 1996: 86).

As Hillier (1992) argues: "*In a grid people start and finish everywhere. Origins and destination are everywhere, with different levels of intensity. This by-product of movement is to generate as many happenings and interactions as possible... enclaves*

are almost, by definition destinations which are not available for 'natural movement'" (in Murrain 1996: 88).

Hillier (1992) sums up the true nature of sustainability in that it is about parts and wholes. Either a new part to an existing whole or a new whole made of parts.

Another definition of permeability sees that "*Places which are accessible to people can offer them choice. The extent to which an environment allows people a choice of access through it, from place to place*" (Ian, B 1985: 12).

Variety, concentration and proximity

The grid gives a social logic to the location of uses resulting from the spectrum of global and local connections. Murrain 1996 adds: "*if pedestrian proximity is a true measure of empowerment, then it would seem appropriate to try to achieve as great a variety of uses and activities within reasonable walking distance of where most people live*" (Murrain, P 1996: 89).

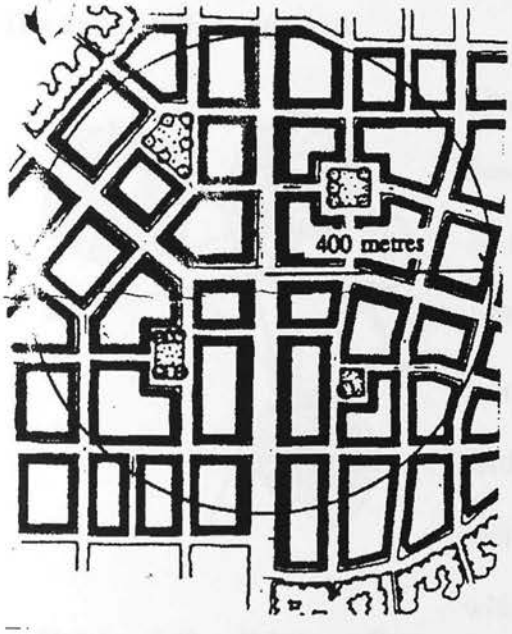


Figure 6.29 The neighbourhood unit: a module of mixed-use (Murrain, P 1996).

Variety of experience implies places with varied forms, uses and meanings. Variety of use the other levels of variety:

A place with varied uses has varied building types, of varied forms

It attracts varied people, at varied times, for varied reasons

Because the different activities, forms and people provide a rich perceptual mix.

Variety of use is therefore the key to variety as a whole.

A basic neighbourhood unit has an approximate 400-metre (see fig 6.29) radius which equates to an area of approximately 125 acres. This radius represents a comfortable walking distance for people; a general measure used in retail design and as a good capture distance for pedestrian access to public transport. Andres Duany adds: "*The neighbourhoods are mixed-use communities balanced to a degree which permits the overall town plan to become self-sufficient to the extent of extremely high trip capture rates... Over the period of a generation, this will provide to all its residents the theoretical possibilities of housing, jobs, shopping, entertainment, education and civic institutions within extremely short driving distances*" (Murrain, P 1996: 89).

The urban village concept

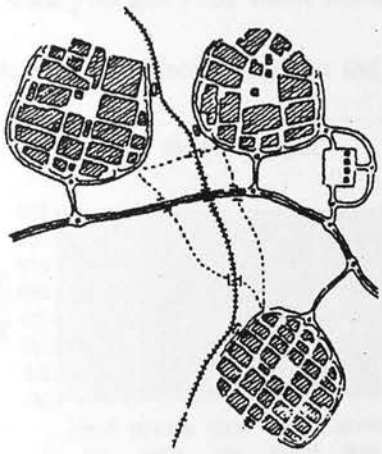


Figure 6.30 Urban village (Murrain, P 1996: 87).

The concept attempts to create "*communities based on mixed uses, human scale, self-sustaining environment and sense of belonging*" (Wael, N 1999: 165). The concept is also an attempt to stimulate the characteristics of traditional settlements today. It identifies the need for an individualistic, self-reliant community nature within settlement form and its architecture with the intention of maintaining vitality in urban life.

Principles of the urban village are:

- Mixed use development with homes, shops, cafes and bars, offices, studios, workshops and accommodation for light or service industry. This has the effect of diversifying urban experiences and creating vitality;

- The existence of daily services within walking distance, thus decreasing reliance on transport;
- An attempt at balancing home-work characteristic by creating a 1:1 ratio between home and workplaces (Wael, N 1999).

The neo-traditional urban concept

A parallel movement to the urban village movement in the UK has appeared in the United State of America. The goals of the neo-traditionalists are very similar to those of the Urban Villages movement. They promote less dependence on the automobile, creation of mixed land use, discouraging urban sprawl, creating a sense of community, improving accessibility, more efficiency of land use and built form.

6.19-Need for Transport

Q: Can you get your basic needs close by?

This variable sheds light on the extent to which it is possible for each respondent to satisfy their needs without recourse to transport. This acts as a variable too for the subject of 'use of transport for needs', and also for questions on the existence of economic activity within walking distance from home and the question on mixed use. This variable showed statistical significance. **Figure 6.31** shows the responses of the samples. The largest group in the Edinburgh sample stated that they could get all their needs close by. In the case of Ottawa the largest group stated that they can get most of their needs close by.

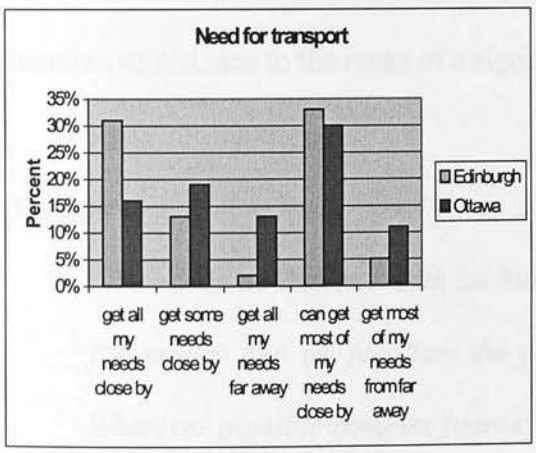


Figure 6.31 Need for Transport

As a whole **Figure 6.31** shows that a greater proportion among the Edinburgh sample can find more of their needs closer to them than in the Ottawa sample.

6.19.1-Land use and transport

The distribution of people, land use and activities is complemented by the attributes of the built environment. Activity densities, all other things being equal, are highest at the centre of the settlement because transportation costs are lower and people's disposable incomes available for purposes other than transportation are therefore higher. Thus most, if not all, cities have an urban core in the form of a central business district, reinforced by decisions of the public sector to locate civic buildings at a place that is convenient to all. Land use at the periphery of cities is less expensive so householders can buy more space in a trade-off for other goods and qualities of urban life that are less important to them than convenient access to public institutions.

One of the most persuasive tendencies of the last 30 years in developed countries is the elevation of distance to the ranks of a significant and desirable consumer good.

Maf says:

> "*We consume distance with an intensity and a fervour that was once reserved for energy and we facilitate the process of consumption by making sure that wherever possible complex journey patterns can be substituted for simple ones, destinations can be widely separated and considerable areas of land can be devoted to highways and car parking*" (Maf 1998: 84).

He adds:

> *"The importance of land use changes over time is critical in understanding societal change from a low energy, space efficient, time efficient model to a space greedy, dispersed energy, inefficient and time wasting model"* (Ibid).

Each year we travel further than the previous year and demand more road space, more parking space, more cash and more fossil fuel energy to make it possible.

> *"Growth in travel has been concentrated on medium distance trips. Typically journeys that 20 years ago would have been under 5 kms in length are now regularly 20 kms or further. Many previously short trips have extended to beyond walking distance, which leads to an increasing use of the car for shorter trips as well as the key medium-length trips. The increase in medium length trips also helps to explain the strong growth that has occurred in traffic on trunk roads and motorways in and around our towns and cities. Intended for long distance trips these roads have become swamped by people undertaking journeys that previously involved only local road networks, and some not even car trips at all. Improvements to such roads simply facilitates a further surge in trip length, resulting in additional capacity being quickly filled"*
>
> (Potter quoted in Maf 1998: 85).

In this quote Potter identifies a key factor influencing one of the most dramatic shifts this century in the structure of the built environment. The built environment is now characterised by more land lake, more mobility and greater levels of dispersion and trip complexity than ever before and requires greater distances and more travel to work, school and shops. Land use and transport is another key for sustaining the urban system considerations should be taken.

6.20-Social Interaction

Q: How satisfied or dissatisfied do you feel about social interaction in your neighbourhood?

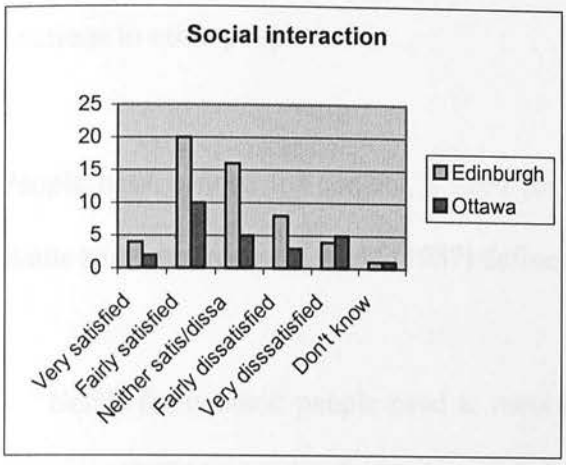


Figure 6.32 Social interaction

This variable aims to give an indication of the level of social interaction in both of the samples. The importance of this variable is not only in the guidance it gives towards assessing the quality of the neighbourhood environment also community relations and cohesion. This variable shows statistical significance. The majority of the interviewees in Edinburgh were fairly satisfied with social interaction.

Figure 6.33 Princes Street Edinburgh (The author 00)

Figure 6.34 Spark Street Ottawa (The author 99)

Respondents were asked to access their satisfaction on social interaction. 36% of the main sample of people surveyed in Edinburgh were fairly satisfied with social interaction, while 30% were neither satisfied or dissatisfied and 42% in Ottawa were fairly satisfied about their neighbourhood.

Social and cultural forces have become important in man's evolution because they largely decide the goals towards which societies are moving. The physical form plays a significant role in the satisfaction of important human values, which have to do with relations to other people.

People have a need for contact, a need for knowledge, a need for establishing social status and entertainment. Gehl (1987) defines man's social needs as follows:

- Needs for contact: people need to meet together with a wide range of people in as many different kinds of experiences and situations as possible;
- Needs for identity with a group;
- Needs for knowledge: a familiarity with other people in a community and their way of life is a comfortable feeling to have;
- Needs for entertainment: a place to feel at ease and where you can relax.

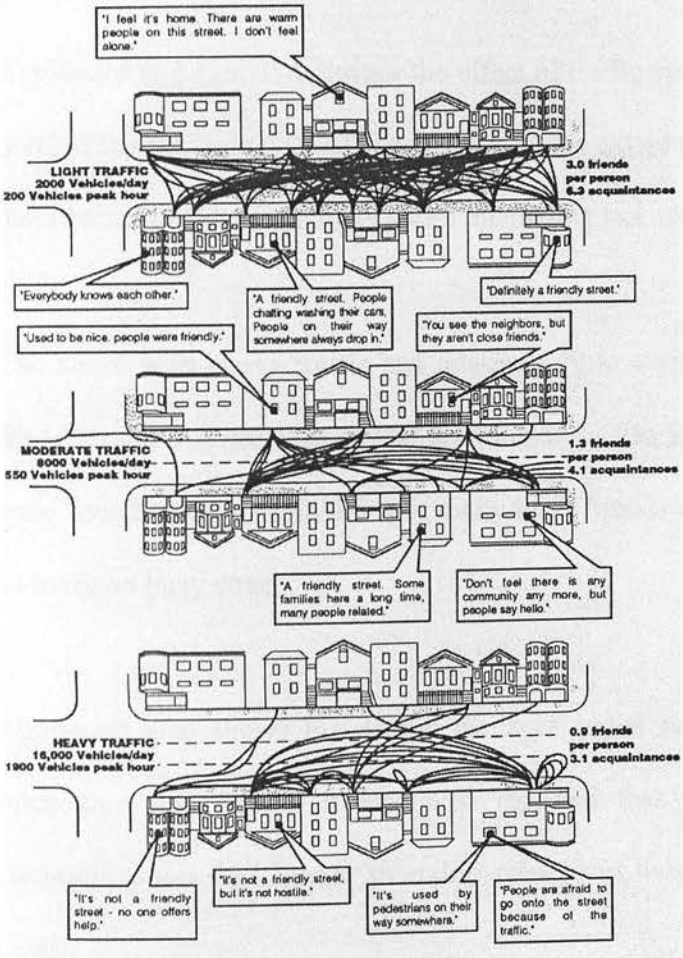


Figure 6.35 Social interaction and traffic (Source: Whitelegg 1993: 102)

The potential to satisfy all these needs, Gehl (1987) says, is in areas where a wide range of experiences comes together.

Jacobs describes the preconditions for social interaction very clearly. At the centre of her account of what makes cities vital and attractive places is the street as an arena for social interaction, sustained by a large variety of uses and mixed residential, service and retail.

Cars obstruct the pursuit of social objectives. They are noisy and intrusive, they carve up neighbourhoods and they encourage fear and isolation. High road traffic, noise and danger are intolerable, which makes people stay away from the streets and use them as little as possible. This reduces trade for businesses and makes residences less desirable so the whole character of the neighbourhood changes (in Whitelegg 1993).

Appleyard and Lintell describes the effect of traffic volumes on social interaction at the level of the individual street. Their work on the extent to which street traffic annoys and disturbs residents and disrupts social interaction has not been surpassed (Ibid).

The street with heavy traffic has relatively little social interaction and residents were found to have fewer friends and acquaintances. On lightly trafficked streets residents were found to have three times as many local friends and twice as many acquaintances as those on busy street.

Appleyard also shows that traffic damages social interaction. To link traffic, social interaction and health, it has been reported that people who lacked social and community ties had higher mortality rates than those with more extensive contacts (Ibid).

Social interactions between members of the community contribute to fulfilling social goal of sustainability (see Chapter 1 section 1.7). Enhancing social interaction enhances the cohesion between people which will contribute as well to the improvement of the quality of life and therefore to the built form as is suggested in Chapter1.

The following variables are meant to measure social variables of the chosen samples, and those that demonstrate social cohesion.

6.20.1-Relationships with neighbours

Q:How would you describe the relationship with your neighbours?

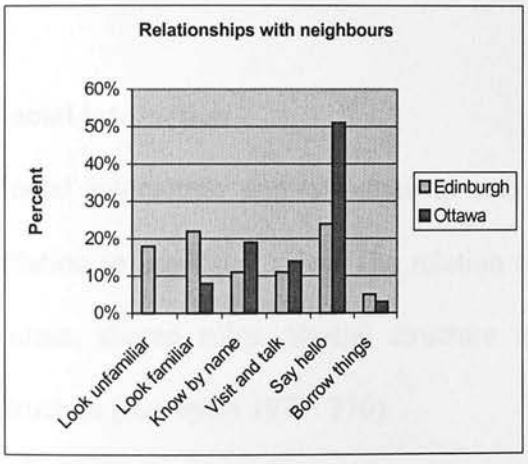


Figure 6.36 Relationship with Neighbours

This variable aims to discover the strength of the relations between neighbours. This variable shows statistical significance. **Figure 6.36** shows the responses of the two samples to how they would describe their relationship with their neighbours. In the Edinburgh sample the most common response was that neighbours 'look familiar' (22 %) and also 'say hello' (24%), while in Ottawa the most common response was that neighbours just 'say hello' (51%): only about 8% said they 'look familiar'.

People were asked how they described their relationships with their neighbours in order to access the degree of relations between neighbours. Different levels of relations were mentioned such as visiting and talking with neighbours, borrowing things or knowing them by name.

6.20.2- Neighbour familiarity

Q: How far do you know your neighbours?

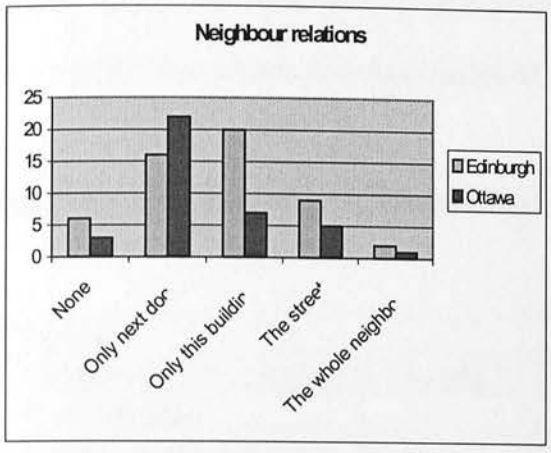


Figure 6.37 Scope of neighbour relation

This variable is meant to discover the scope of the neighbourhood, i.e. how far do neighbours know each other. 29% (16) know their neighbours only next door 16% (9) know their neighbours at street level, 4% (2) know the whole neighbourhood.

Social interaction

Social interaction and activities in settings depends on appropriate cues and their relation to unwritten rules. The relation of social and spatial structure is mediated by norms, shared rules. Spatial structure not only reflects but also influences social structure (Rapoport 1977: 270).

Friendship

The separation of the city into a series of social worlds depends on the variety of environmental preferences and the social distance among groups, as well as the evaluation of their separateness. Actual physical distance in not always a good indicator of social distance it is a matter of subjective distance or separation in social urban space (Rapoport 1977: 272).

There are several concept involved in neighbouring, including friendship, the various role behaviours appropriate and desired among those living in proximity, and the area

itself. The differences among various forms of neighbouring and neighbourhood are related to different expectations and specific forms and differing importance of the spatial locale. The location of people in the city, and the nature of their networks and activity patterns affects their knowledge of the city and hence how they use it.

6.21-Evaluation of Neighbourhood

Variables	Edinburgh	Ottawa
Neighbourhood as a place to live **(sig.)**	(42%)	(27%)
Street life **(sig.)**	(36%)	(22%)
Variety of facilities	(40%)	(29%)
Social interaction	(40%)	(36%)

(sig.) statistical significance

Table 6.9 Evaluation of neighbourhood

Table 6.9 above summarises the findings of people's evaluations of their urban environments. Variables relating to the quality of the neighbourhood environment are compared in this table. In this case a much larger number of variables are statistically significant, as listed in the table above. The variables used in the evaluation of respondent's perception of their satisfaction towards aspects of their neighbourhood are divided into social and functional. Social variables including street life and social interaction were tested high in the case of Edinburgh. Functional variables include variety of facilities. It can be concluded that the satisfaction of the variables which contribute to sustainability were tested overwhemly in Edinburgh than in Ottawa.

	Very satisfied		Fairly satisfied		Neither satisfied or dissatisfied		Fairly dissatisfied		Very dissatisfied	
Neighbourhood quality										
Count	18	19	23	10	10	2	3	6	1	-
%	32.7%	51.3%	41.8%	27%	18.2%	5.4%	5.5%	16.2	1.8%	-
Street life										
Count	11	15	20	8	15	4	5	5	2	2
%	20%	40.5%	36.4%	21.6%	27.3%	10.8%	9.1%	13.5	3.6%	5.4%
Variety of facilities										
Count	13	9	20	11	9	4	4	2	2	5
%	23.6%	24.3%	36.4%	29.7%	16.4%	10.8%	7.3%	5.4	3.6%	13.5%
Social interaction										
Count	4	3	20	15	16	5	8	4	4	7
%	7.3%	8.1%	36.4%	40.5%	29.1%	13.5%	14.5%	10.8	7.3%	18.9%
Overall neighbourhood satisfaction										
Count	11	13	23	15	11	6	2	1	-	2
%	20%	35%	41.8%	40.5%	20.2%	16.2%	3.6%	2.7	-	5.4%

Edinburgh

Ottawa

Table 6.10 Neighbourhood satisfaction

6.22-Transportation Satisfaction

Q: How satisfied or dissatisfied do you feel about transportation?

Figure 6.38 Nicholson Street in Edinburgh (The author 00)

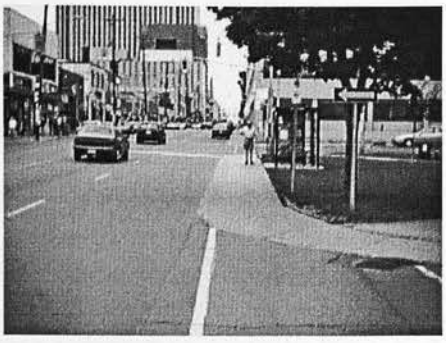


Figure 6.39 Elgin Street Ottawa (The author 99)

This variable aims to measure the use of different modes of transport to fulfil daily needs. It defines to some extent the existence of services and their vicinity. As can be seen in the chart **(Figure 6.46)**, walking was the most important mode of transport to fulfil daily needs in the Edinburgh sample.

A transportation system affords human ease of access to distant groups, sites and facilities. Differences in attitudes to settlements may be related to transportation facilities. Daily travel in Edinburgh to work is more frequently done by walking (24% or 13 of the respondents) or by bus (21.8%), and the inhabitants' evaluation of the transportation system is one of general satisfaction.

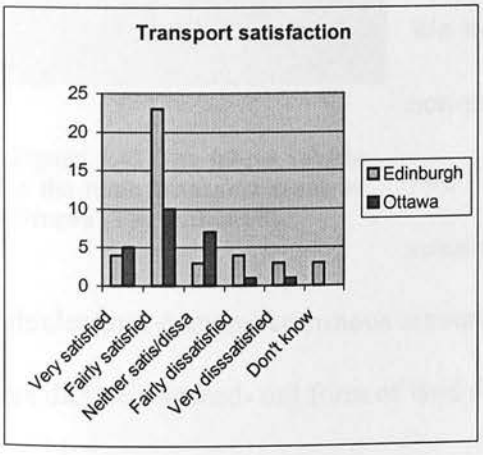


Figure 6.40 Transport satisfaction

Transportation and land-use are inextricably linked to each other and to the ultimate of human settlement. To the degree, however, that changes in transportation policy and technology imply and affect changes in the way land is used, transportation can be seen as

the dominant factor in the relationship. Both directly and indirectly, the term sustainable urban system implies enormous changes in transportation system that seeks to reduce dramatically the use of non-renewable fossil fuels, which are the dominant energy source for today's transportation systems.

Figure 6.41 Public transport in Ottawa Billing Bridge bus transit. (The author 00)

In addition, a sustainable system should seek to minimise the impact of development on the natural environment by promoting higher density development, more compact community form, and greater physical integration of land uses. In short, the primary impact of a sustainable urban system will be a dramatic reduction in the number of private cars, a reduction in the number of automobile trips, and a decrease in the total vehicle miles travelled. Effecting these goals implies additional changes: new alternative forms of mobility and different patterns of land uses.

Motorised vehicles

Figure 6.42 The motor vehicle is the main transport mode in Ottawa (The author 00)

Cars not only take over the immediate space they need in motion, they also have a zone of influence, which expands as speed and the quantity of traffic increases. We may be on the verge of developing cars that are non-polluting and use only renewable fuels, but the very dimensions of cars make them less than sustainable. Cars are large, heavy, fast-moving vehicles that demand enormous amounts of space to function effectively: of necessity, cars dictate a spread- out form of land development.

Pedestrians

Figure 6.43 Pedestrians in central Ottawa (The author 00)

Pedestrians are catalysts that make the essential qualities of communities meaningful. They create the place and time for casual encounters and the practical integration of diverse places and people. Without the pedestrian, a community ground, its parks, pavements, squares and plazas become useless obstructions to the car (CUTR[1] 1994). Every form of mobility starts as pedestrian movement. Even if one is walking from the house to the car, from the office to the parking lot, from the car to the store, every form of transportation relies to some degree or the most primal of motive forces: our feet. All too often, however, this very simple and very necessary movement system is neglected in the light of other more technologically sophisticated systems. While it is true that a car defines a much greater radius of travel within a fixed amount of time than does a pedestrian, cars imply much lower levels of density than do pedestrians.

Bicycles

Cycling is an increasingly important element in transportation strategies to achieve sustainable development. It offers health, environmental, economic and other benefits. It is suitable for many local journeys and can be used in combination with public transport for longer trips. One desirable means of transportation would be something efficient, non-polluting, simple to manufacture and to repair, energy conserving, cheap, and harmless.

[1] CUTR: Centre for Urban Transportation Research

The bicycle is the most energy-efficient form of transportation known. An average automobile uses about 18,000 calories for the same trip (CUTR 1994). The bicycle creates no air pollution. It takes up very little space. Throughout the world, by an enormous margin, the bicycle is the most popular form of non-pedestrian locomotion. This is for good reason: the bicycle is the most efficient means yet devised for translating mechanical energy into forward movement. Across the world, the gap in numbers between bicycles and cars is actually growing (CUTR 1994).

Public transport

Bus systems

Most urban public transport is provided by buses. Buses can transport large numbers of people while occupying relatively little road-space, thus offering a highly cost-effective use of resources. Buses also crucially provide mobility to those who do not have the use of car. Specially equipped public transport vehicles can also provide accessible transport for people whose mobility is impaired.

Figure 6.44 Public transport in Edinburgh. Source the author 00

Buses can be flexible in operation and can respond rapidly to changing patterns and levels of demand but are adversely affected by urban traffic congestion. In most countries functional, affordable transportation options to the personal car exist on a wide spread basis. Buses afford freedom of individuality of the private automobile, it does tend towards integrated, dense, mixed-use land uses that are most commonly associated with urban society and culture.

6.22.1-Car ownership

Q: How many cars do you own?

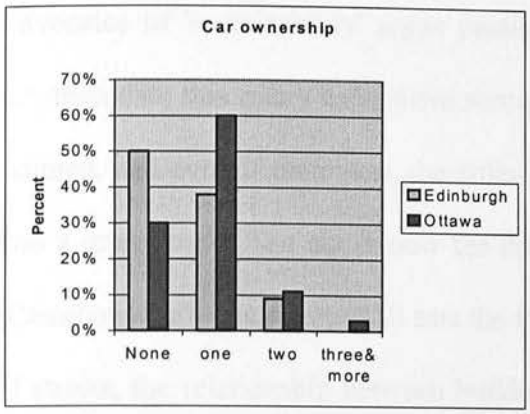


Figure 6.45 Car ownership

This variable aims to measure the ownership of a car as a mode of transport for daily use and for work. As can be seen from the chart, 50% in Edinburgh do not own a car and about 40% own one car. In Ottawa about 40% do not own a car with 60% own at least one car.

Beginning before the Second World War but really accelerating after it, the car has progressively become the transport technology that has shaped the city (Newman, 1995). Together with the bus it made it possible to develop in any direction, first filling in along the rail network and then spreading the city area as far as 50km from its centre. The city began to decentralise and disperse. The auto city as described by Newman has reduced in density to between 10 and 20 people per hectare. North American cities have grown most of all in the car era (Newman, 1995). Now, after 50 years of such car based growth, such cities have spread almost to the limits of comfortable car commuting. Their car-based, low density suburbs have become a normal living environment for their citizens who have largely known no other style of city despite its relative novelty in urban history. But new suburbs beyond 40-50 km from the city centre have an extra dimension of isolation from traditional urban functions. And the level of car-based problems in such cities is growing rapidly.

Paramount among the villains in the eyes of those advocating 'sustainability' is the personal car, the infrastructure that both spawned it and depends upon it, and the

lifestyle that it facilitates. Currently there are nearly 400 million cars in the world. It is estimated that this number will rise to 700 million by the year 2025 (CUTR 1994). Advocates of 'sustainability' argue passionately that the world will never be able to accommodate this many cars; there simply won't be enough fuel to power them, it is claimed, and even if there was, the pollution they create would quickly turn the world into a greenhouse. The car is now the defining technology of the Northern American (Canadian) built environment. It sets the form of the cities and town, dictating the scale of streets, the relationship between buildings, the need for vast parking areas, and the speed at which we experience the environment.

The car dominates what were once diverse streets shared by pedestrians, bikers and shoppers. And, more importantly, the car allows the ultimate segregation of land use, for example in separating home from job. The car has come to dominate the public realm, extending the private world from garage door to parking lot.

Cars are large, heavy, fast-moving vehicles that demand enormous amounts of space to function effectively: of necessity, cars dictate a spread out form of land development (Ottawa). Even if cars become energy benign, they will dictate an inefficient use of land and other natural resources and will contribute to further social fragmentation (Newman 1996).

Environmental	**Social**	**Economic**
Urban sprawl	Loss of street life	Pollution, health
Traffic problems	Loss of community	Congestion cost
Noise	Loss of public safety	Sprawling suburbs
High greenhouse gas	Isolation in suburbs	Loss of time
Oil vulnerability		Increasing distance

Table 6.11 Problems of automobile dependence (Source Newman, 1996: 5)

The problem of the car in cities is that the freedom and power it gives come at a cost. It easy to see some of the car-based environmental costs in polluted air, noisy environments and acres of bitumen for parking and roads. But problems such as urban sprawl as in Ottawa are also fundamentally due to an overemphasis on cars which facilitates dispersed, low-density suburbs. Now an increasing number of economic and social issues are also associated with excessive car use, due fundamentally to the way that freedom over space and time undermines community **(see Table 6.12)**.

6.22.2-Transport to work

Q: By which mean of transport do you go to work?

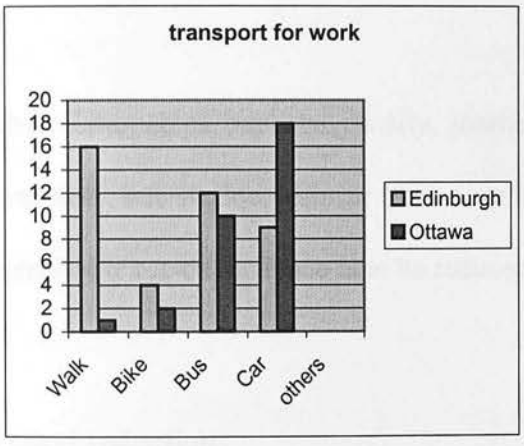


Figure 6.46 Transport for work

This variable aims to measure the use of different modes of transport to fulfil daily needs and for work. This variable is statistically significant. Results are very different in both samples. In both cases a large number use the bus as can be seen from the chart **(Figure 6.46)**. 58% use the car in Ottawa, making it the dominant mode of transport used to get to work. In Edinburgh only 22% use the car while the dominant mode of transport is walking, rating 39%.

The use of the bus is significant in both cases, where 30% use the bus in both samples. The high level found walking to work in Edinburgh reflects the proximity of work to home in that city.

Transport

Many initiatives have been adopted towards restraining traffic measures to reduce traffic demand. To reduce carbon dioxide emissions from road transport traffic, it is required to tackle the problem of the number of vehicles on the roads. There are many techniques for promoting public transport, managing and limiting the use of private vehicles, and encouraging other modes of transport such as walking and cycling.

Promoting public transport has implications for urban form, not just in the sense of creating stronger sub-centres within the city fabric, but also encouraging linear development of cities along public transport routes (Owens 1991).

The relationships between density, journey lengths and choice of transport mode are complex, but it does appear that co-ordinated land use and transport planning is essential if car-dependence is to be reduced (Ibid).

Travel reduction

The aspiration to reduce travel and particularly car travel is increasingly finding its way on the policy agenda across Europe (CEC, 1998), and is addressed on all scales. In the UK a recent white paper on transport has placed a strong emphasis on reducing travel and encouraging alternatives to the use of the car where possible (Banister 2000).

Banister (2000) adds that travel reduction can take a variety of forms:

-A reduction in the number of trips made;

-A reduction in vehicle kilometres, by reducing the distance involved in trips;

-A reduction in vehicles, by reducing the number of vehicles in trips, e.g. by changing from low-occupancy cars to high-occupancy public transport;

-A reduction in vehicle hours or minutes, e.g., by travelling at off peak times to avoid the time and energy spent in congestion, also constitute travel reduction.

In each of these cases the amount of travel involved is in some way reduced, while the purpose of the trip is still fulfilled. Thus, one may reduce travel by shortening or cutting out, the journey to work, but the work activity itself can still take place.

Traditional measures such as the promotion of public transport or the restriction of road capacity continue to provide valuable solutions, but there are other approaches, such as the application of technology or land-use planning. For example, developments in computer and communication technologies have made possible the introduction of 'teleworking' to replace the need to travel to work.

Car pooling

Car pooling occurs when two or more people share one car ride for several trips (usually commuting), where previously each individual had made their own car trip. This substitution by linking several trips into a single one reduces the overall number of vehicle kilometres. Car-pooling can be arranged informally between colleagues. Car-pooling is different from car sharing, where individuals share ownership or access to a car to make their individual journey (Banister 2000).

Car sharing is one of the few measures which reduces travel by influencing car ownership. It gives individuals access to a car without ownership, through the mechanism of collective provision, whereby individuals can use a car from a pool. It is believed that a lack of ownership will lead to the more selective use of the car by combining car trips and using other means of transport. Therefore car-sharing schemes

encourage substitution by linking trips and mode switching to achieve travel reduction. In principle there are two methods of car sharing one is to share a car informally with neighbours, friends or relatives; the more formal alternative is to have joint access to a fleet of cars owned by a car sharing organisation and supported by city or company travel policies at a regional level (Ibid).

Walking and cycling

Promoting walking and cycling can reduce the use of motorised transport in urban areas and thereby help improve the environment. As Owens adds: "*The most energy-efficient forms of travel are cycling, walking, buses, rail and then the car*" (quoted in Haughton 1994: 98).

Walking and cycling are important modes of transport that have a great deal to contribute to the efficient and environmentally friendly movement of people particularly in cities.

Walking and cycling have a great deal to offer to the development of healthy cities through a reduction of motorised trips, particularly over short distances and a commensurate reduction of noise and pollution.

The Transport and Health Study Group have identified exercise from walking and cycling as a factor in reducing the risk of heart disease. The work of Goldblatt show that men who walk or cycle to work have a lower rate of death from heart disease than men who travel to work by car. Cycling and walking provide easy and cheap access to physical activity which sustains physical fitness (Whitelegg 1993).

Street calming and road reclamation

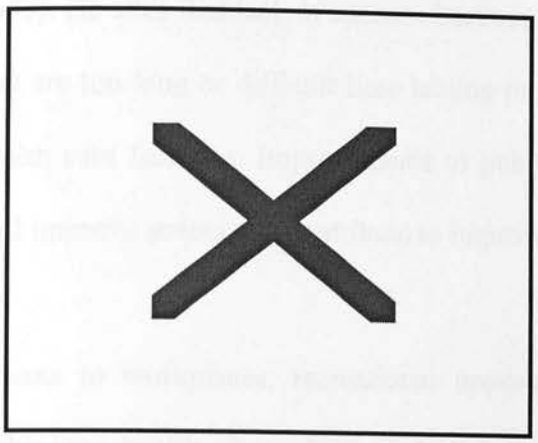


Figure 6.47 Road reclamation. Source (Philip, H Lewis 1996: 141)

Such initiatives can contribute to both social and environmental goals of sustainability. The aim of them is the discouragement of car use, particularly in residential areas, and reclaiming areas for social activities rather than transport accessibility. Street calming methods are used in varied ways of which decreasing road width and creating twists and bends while establishing green spaces and seating in the reclaimed areas. Reclaiming roads areas is another option that achieves the same objectives more effectively. In this case larger areas can be made available than can be used for public parks and amenities. Other uses include making greenhouses and urban gardening projects for farming high quality foods and possibly the formation of playgrounds or nurseries.

Health and transport

Transport in its many forms has a significant impact on health. Transport and Health Study Group produced a summary of the ways in which transport influences health, divided into health promoting and health damaging groups.

Type of effect	Results
Health promoting	Enables access to: employment, education, shops, recreation, social support networks, health services, countryside; provides recreation and exercise.
Health damaging	Accidents; creates pollution: carbon monoxide, nitrogen oxides, hydrocarbons, ozone, carbon dioxide, lead, benzene; noise and vibration; creates stress and anxiety; danger; leads to loss of land and planning blight; leads to severance of communities by roads.

Table 6.12 Ways in which transport influences health (Source Whitelegg 1993: 97)

Access to places and facilities is important for the maintenance of health (Whitelegg 1993). He adds that lack of access - because of poor public transport, walking distances that are too long or difficult time tabling problems - can lead to lower levels of use of health care facilities. Improvements to public transport, walking and cycling facilities will improve access and contribute to improved health (Ibid).

Access to workplaces, recreational opportunities and to friends and relatives also influences health. A system of land uses and transport provision that minimises distances separating activities and maximises the opportunities for walking, cycling and reasonably priced public transport brings with it substantial gains for labour market efficiency, income growth and access to all those facilities that sustain health. This includes shops, schools and recreational facilities (Ibid).

6.22.3-Influence of the weather on transport type

Q: Does the weather influence you to use the car?

Figure 6.48 Harsh cold weather in Ottawa (The author 00)

This variable examines the influence of the weather on the use of a transport type. The weather did not show a statistical significance between the samples of the survey. The chart shows that the weather is not a major influence on the choice of the transport. In Edinburgh the largest number of respondents (40 %) and in Ottawa the majority of (72 %) of the respondents were not influenced by the weather.

Lang (1994) argues that because of the availability of climate control mechanisms, may not reflect the climatic differences of cities as much as in the past, the climate is still a major factor in shaping urban form and certainly in shaping the lifestyles of a city's inhabitants.

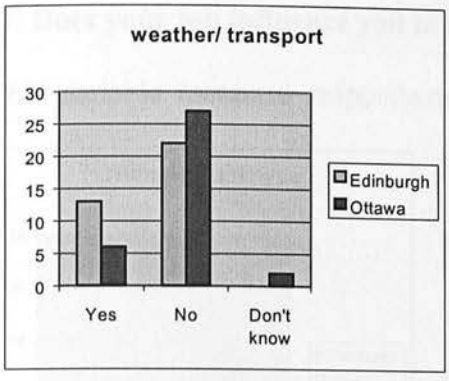


Figure 6.49 Weather /transport

In preindustrial cities, the distribution of buildings in space is very much a response to the comfort needs of their inhabitants. There are major differences between designed cities located in cold zones. "*Our ability to air condition and/or centrally heat buildings and to enclose open space has reduced the necessity to design with the climate in mind, rather than against it, though the expense involved is high*" (Lang, 1994: 36).

Owens (1991) suggests that attention to microclimate can reduce heat loss from buildings in a number of ways, for example by controlling wind speed and by raising external ambient temperatures. Appropriate measures include the use of particular materials, attention to building layout, landscaping and planting shelter belts of trees. Preliminary results suggest that savings might be of the order of at least five per cent and perhaps considerably more on exposed sites.

She adds: "*microclimatic considerations would also influence the location of new development, but in most urban areas where land is scarce, the important requirement will be to make the best use of microclimate on sites selected for other reasons*" (Owens 1991: 5).

6.22.4-Influence of job type on transport type

Q: Does your job influence you to use the car?

This variable measures respondents' answers on the impact of the job type on the transport. The variable did not show a statistical significance. The chart shows that neither sample were influenced by their job type for the choice of a mode of transport. 38% of the respondents in Edinburgh were not influenced by the type of job nor were 62% of the interviewees in Ottawa. It can be concluded that for a sustainable urban system that the relationships to transport and job type employers should encourage less use of the car as it has been described earlier.

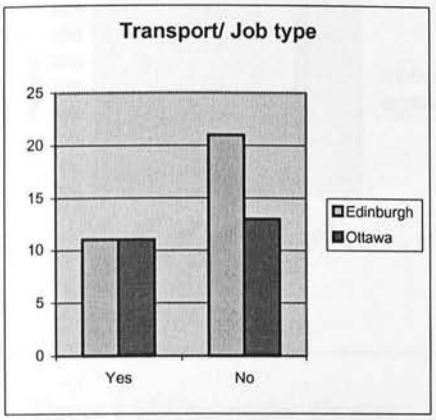


Figure 6.50 Transport by job type

6.22.5-Commuting time and commuting distance

Q: How much time do you spend in commuting?

This variable shows a statistical significance. Time spent for daily commuting to work is higher in Ottawa than in Edinburgh. 22% of the respondents in Edinburgh spent between 30-45 minutes for commuting, and only 11% in Ottawa spent an equivalent time. 20% in Edinburgh spent between 1-1.5 hour commuting compared to 29% in Ottawa spend the same time. Commuting time contribute to sustainability the coming section will elaborate on time waste.

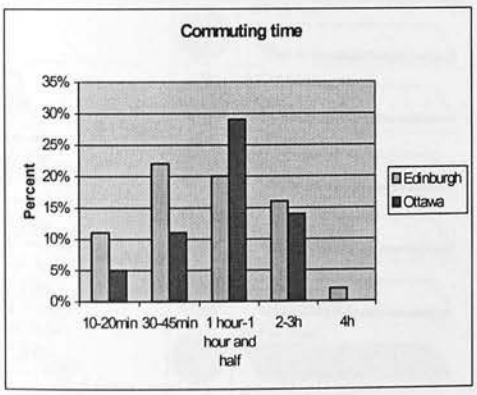


Figure 6.51 Commuting time

Q: How many miles do you usually do in commuting?

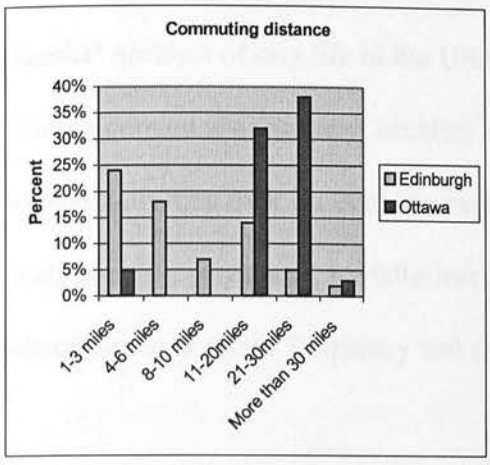


Figure 6.52 Commuting distance

This variable measures respondents' answers on daily commuting distances to work. This variable shows a marked statistical significance. 24 % of the respondents from Edinburgh made between 1-3 miles daily commuting distance and 18 % between 4-6 miles. In Ottawa daily commuting distances were much longer. 32 % of the respondents did between 11-20 miles daily and about 36 % travel between 21-30 miles. Commuting distance contribute to sustainability. The notion of time waste on transport and distance to work could have an impact on economy and social life. (The notion of time is addressed in detail in the coming section). Long distance has replaced short distance to work; increasing distance has also increased space for motorways, which had many environmental consequences, such as the destruction of land and pollution as described earlier.

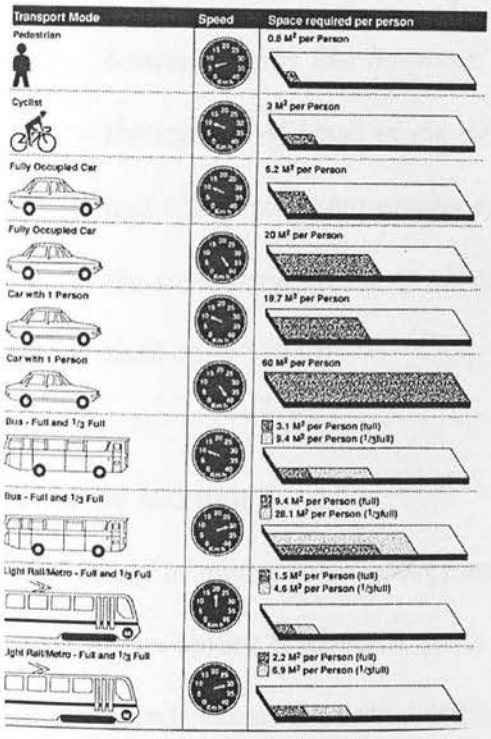


Figure 6.53 Consumption of space by different modes of transport, occupancy and speed (Source Whitelegg 1993: 79).

Time pollution

Time is a fundamental metric in transport, as in all aspects of human organisation. Hagerstand emphasises access to facilities identified the importance of making contact with places and people as the central organising feature of human activity (Whitelegg, J 1993). It is this contact, rather than either the means or the

speed of transport, that determines the success of a transportation system (Ibid). Even more importantly it is this contact that determines the quality of life in cities. Jane Jacobs' account of city life in the USA shows just how important diversity and ordinary human contact are to safety, security and feelings of well being. Societal processes that spread activities over an ever increasing space-time continuum achieve the opposite of well being: a privatised, socially inert world where neighbourhood counts for little and status depends on the frequency and speed of movement over longer distances.

" *It is relatively easy to increase the speed at which we move around but quite difficult to ensure that we can carry out a large proportion of our activities with a small time penalty and with considerable spin-offs for neighbourhood, community and attractive city forms*" (Whitelegg, J 1993: 76).

> ..."*What is clear is that we must travel further to make contact with work, shops, schools and places of recreation. Since we are able to increase distances between things like hospitals, schools, and shopping centres, but not increase the number of hours in the day, then we must increase speed. Basically we use technology to permit greater speeds but still work, eat sleep and play in roughly the same proportions as always. We simply do these things further apart from each other*" (Ibid).

Distance and time

The history of transport technology and the development of society is a series of distinct steps in the ability to cover a given amount of distance in a given amount of time. Higher speeds extend the spatial domain in any given allocation of time.

Whitelegg argues:

> "*Thus we can compress distance by conquering time and allocate society's benefits by giving people more time to overcome distance or privileged access to mode of transport with higher speeds. In either case the results are socially skewed*" (Whitelegg 1993: 78).

The ability to buy distance with time savings has other serious consequences. Marchetti has shown that there is a rough correspondence in the amount of time devoted to travel regardless of how fast or how far is travelled.

He adds that:

> "*Speed and its distance gobbling effect is a major polluter. It pollutes space, time and the mind. Space has to be consumed in large quantities to provide the infrastructure for high-speed travel, the faster the mode of transport the more space it requires*" (Ibid).

Low speeds and non-polluting modes require very little space (compare the space requirements as shown in **Figure 6.53**). Urban motorway construction and 'relief' road construction provides the ultimate expression of destruction rooted in speed and the destruction of community rooted in the pursuit of mobility for the minority.

Time has to be saved rather than enjoyed and in a subtle reversal of historical priorities anything that saves time is a good thing and anything that wastes it is a bad thing. Time is a valuable resource which should be conserved so that it can produce socially useful products. The urge to save time is fuelled by the belief that the next task is more important than the present task and that speed and crowded diaries correspond to social importance. This is pollution of the mind where no one has time for a leisurely exchange of views with a friend or colleague or for the kind of social interaction that

nurtures community. The production of community needs an investment of time and energy in contact with neighbours and local groups. The opportunities for such contact depend on time available and priorities. The ability to travel longer distances (and save time at higher speeds) means that no time is available for intense interaction with neighbours and groups and so there is little chance of genuine community developing.

Limiting Speed

In order to put a direct limit on automobile use, the simplest way to do this is by limiting speed. Increasing speed increases the distances people travel. As the time people spend travelling remains constant, higher speeds generate suburban sprawl further from where people work, and regional shopping centres further from where shoppers live. Contrariwise, gradually reducing the speed limit for automobiles would not only shift longer trips to public transportation; even more important, it would encourage people to shop locally rather than regionally shopping, and to live nearer to where they work. Increasing speeds generate suburban sprawl by letting people travel further, similarly reducing speeds would stop and may ultimately reverse sprawl (Whitelegg 1993).

Time and social cost

Pedestrians, cyclists and public transport users are undervalued and underrated throughout the planning process. High speed methods of transit with their heightened fatality rates, pollution rates, space sterilisation potential and community disruption effects are valued much more highly than low speeds.

It is not difficult to imagine cities restructured so that they serve the needs of people and not cars. This involves the encouragement of walking, cycling, lingering, mutual observation and sociability.

Time, therefore is central to notions of sustainability. A sustainable city or a sustainable transport policy or a sustainable economy cannot be founded on economic principles, which through their monetarisation of time orientate society towards higher levels of motorization, faster speeds and greater consumption of space (Whitelegg 1993).

6.22.6-Transport and energy satisfaction

Q: How satisfied or dissatisfied do you feel about energy use on transport?

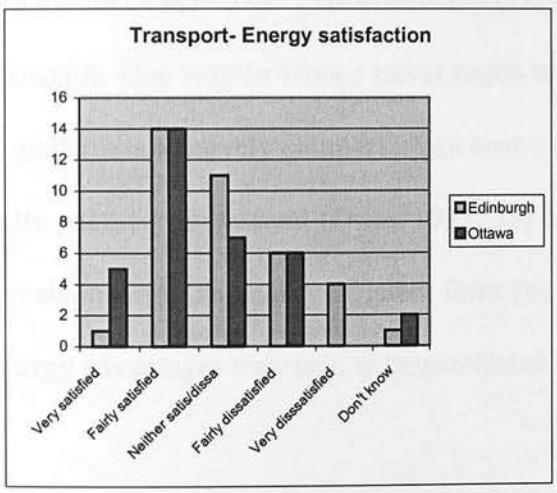


Figure 6.54 Transport -energy satisfaction

This variable looks at the satisfaction of the interviewees with the energy used on transport. 43% of the interviewees in Ottawa were fairly satisfied about energy used on transport by only 25% of the interviewees from Edinburgh. This variable shows a marked statistical significance.

Owens (1991) argues that rapid growth in car ownership has permitted more dispersed patterns of urban development which require longer journeys for most daily activities and have become increasingly difficult to serve by energy-efficient modes of transport.

The energy and environmental implications of these trends are alarming because predicted traffic growth is likely to outstrip measures to improve the energy efficiency

and environmental performance of vehicles. European Community legislation already requires all cars to be fitted with catalytic converters which will help reduce emissions of carbon monoxide (Owens 1991).

Owens (1991) adds for sustainable urban development measures should include reducing the need for movement and to provide favourable conditions for energy-efficient and environmentally friendly form of transport should be included.

Reducing the need for movement

Some land use patterns are potentially efficient in the sense that they reduce the need for travel (Owen 1991). At the urban scale the most important factor is the physical separation of activities. This affects travel needs, and therefore energy requirements for transport. One way to reduce travel needs would be to bring homes, jobs and services together in a relatively compact urban centre to achieve a high level of accessibility with little need for movement (Owen 1991: 12) many studies suggest that concentration of development is an energy efficient form (as, indeed). Higher densities also have other energy advantages they tend to be associated with energy-efficient built forms.

An alternative way to reduce the physical separation of activities is to decentralise some jobs and services and relate them to residential areas, either within a single large urban area. In theory 'decentralised concentration' often emerges as relatively efficient in terms of travel and energy requirements (Owens 1991).

6.23-Evaluation of Work Place in Relation To the Living Place

Q: How satisfied or dissatisfied do you feel about the location of your place of work in relation to your living place?

This variable showed statistical significance. 57% of the interviewees in Edinburgh were fairly satisfied about the location of their working place in relation to where they live, but only 31% of the interviewee in Ottawa were fairly satisfied about the location of their working place.

The location of the work place is a contributor towards sustainable urban system. Rather than having employment close to living places, cities begun to sprout, particularly in Ottawa, low-density employment belts dispersed along highways (such as high tech firms in Ottawa).

Density

The effect of low density on transportation is visible in the act of daily commuting in Ottawa. The separation of work place from residential area, forced by large-scale land use segregation, means that very few people can walk to work. Higher mixed densities could be associated with reduction in travel demand and the encouragement of shifts towards emission-efficient modes. The dispersal of population from major centres has been associated with increases in travel demand and a shift away from public transport towards the private motor car.

The potential role of density in influencing both the distances people travel and their choice of mode has been explored in a variety of studies. Density can impact on travel in different ways:

- Higher population densities widen the range of opportunities for the development of local personal contacts and activities which can be maintained without resort to motorises transport;

Higher density patterns of development tend to reduce average distances between place of residence and the places at which services, employment or other opportunities can be accessed. This potentially reduces the need for travel and increases the practicability of using non-motorised modes (HMSO, 1993: 33)

Distance

Longer distance between residential areas and work place means an increase of car use which has more has more impact on the environment in term of traffic, pollution and noise.

6.23.1-Life / work spatial relationships

Q: Where do you work in relation to where you live?

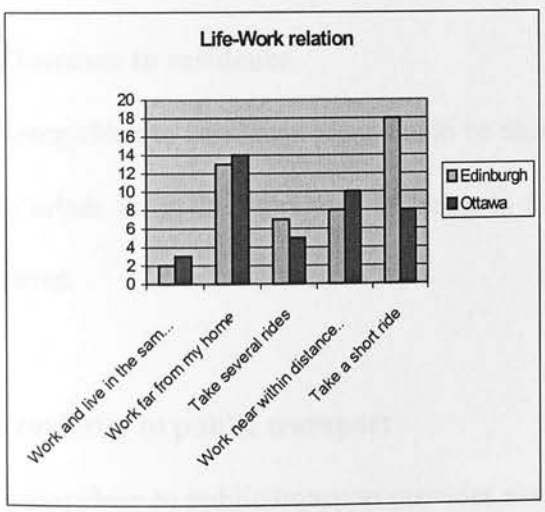


Figure 6.55 live work spatial relationships

This variable detects the need for transport use to work in the case of Ottawa. More importantly, it assesses the relationship between home and work. It showed statistical significance. In the case of Edinburgh sample it can be seen that the majority (60%) of people stated that they take a short ride to go from home to work. It is also seems that individuals' choice of location of residence to some extent depends on how far from their employment it is, as **Figure 6.55** shows that 50% of both samples stated that they work and live in the same

neighbourhood. In Ottawa 34% of the interviewee work far away from home. In Edinburgh it appears that the home/ work relationship is stronger and that work lies in closer proximity to home.

6.23.2-Re-selection of the work place

Q: If you had the chance to re-select your work place, which conditions would be of the greatest priority in your consideration?

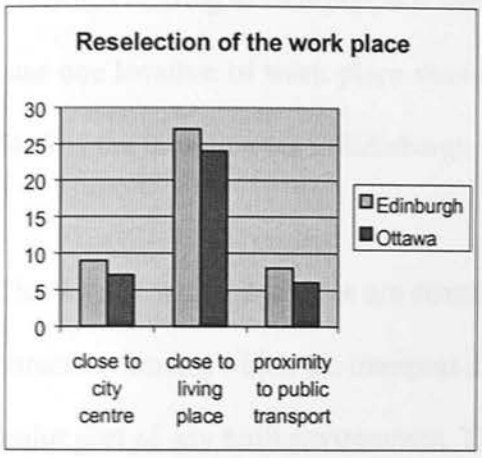


Figure 6.56 Re-selection of the work place

This variable looks at people's desire to re-select their working place close to where they live. The vast majority of the interviewees in Ottawa 65% were in favour of a reselection on the basis of proximity to their living place. In Edinburgh 49% indicated the desire to change in order to be closer to their living place. This notion contributes to sustainable urban systems.

Closeness to residence

Being close to residence place could be seen as a contributor towards sustainability and to urban form. It refers also to being to a close distance to living place as described above.

Proximity to public transport

Being close to public transport provides easy access to facilities and work places. Public transport contributes to sustaining the urban environment.

Variables	Edinburgh	Ottawa
Transport	(42%)	(38%)
Energy –transport	(25%)	(38%)
Facilities	(27%)	(43%)
Location of work place **sig.**	(56%)	(30%)

(sig.) statistical significance

Table 6.13 Evaluation of Work Place location

Variables relating to transport and work place can be found in **Table 6.13** above. In this case one location of work place shows a higher statistical significance it was raised by 56% of the interviewees in Edinburgh but only 30% in the case of Ottawa.

The way in which activities are structured within the urban fabric affects a number of outcomes among which are transport distances. Diverse forms of activities constitute the major part of any built environment. The distribution of these activities within the urban form is a determinant of the physical characteristics of the settlement. They determine

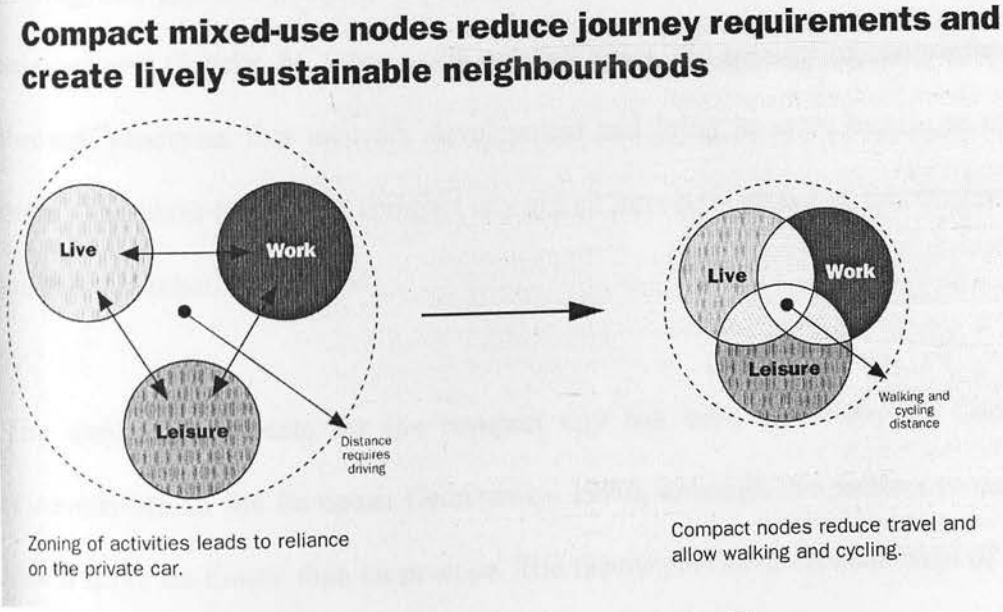


Figure 6.57 Compact mixed-use nodes (Source Rogers, R 1997: 39).

home /work relationships, home /services relationships and homogeneity or diversity of the urban landscape in terms of uses.

The built environment is characterised by more land lake, more mobility and greater levels of dispersion and trip complexity than ever before and requires greater distances and more travel to work, school and shops. Long distance has replaced short distance to work; increasing distance has also increased the need for space for motorways, which has had many environmental consequences.

Rogers (1997) suggest that compact mixed-use nodes could reduce journey to work as can be seen in **Figure 6.57**. He adds " *The creation of the modern compact city demands the rejection of single-function development and the dominance of the car*" (Rogers, R 1997: 38).

Urban form

There is a strong link between urban form and sustainable urban development. It is suggested that a sustainable city "*must be of a form and scale appropriate to walking, cycling and efficient public transport and with a compactness that encourages social interaction*" (Jencks, M 1996: 5). In existing cities, the concept of compaction arises through processes that intensify development and bring in more people to revitalise them. The ideas behind the compact city are an important strand in the attempt to find sustainable urban forms (Ibid).

The strongest advocate for the compact city has been the European Community (Commission of the European Community, 1990), although the policies proposed are based more on theory than on practice. The theory provide a concentration of socially mixed uses that will concentrate development and reduce the need to travel, thus reducing vehicle emissions. The promotion of the use of public transport, traffic calming, walking and cycling are often cited as solutions. Further reductions from

harmful emissions might also accrue from more energy efficient land use planning, combined power and heating schemes and energy efficient buildings. Higher densities may help to make the provision of amenities and facilities economically viable enhancing social sustainability (Jenks 1996).

Differences between cities mean that the compact city is not just a simplistic concept, drawing on particular reified urban forms. As Haughton and Hunter point out:

> "*The sustainable city is not routed in an idealised version of past settlements, nor is it one given to a radical casting off from its own particular cultural, economic and physical identity in the name of the latest passing fad for urban change*" (quoted in Jenks M, 1996: 5).

The relationship between urban form and sustainability is currently one of the most hotly debated issues on the international environmental agenda (Jenks M, 1996). There are those who believe that compact cities are an important component of a sustainable future. Hillman, for example argues that compacting the city is one way of reducing travel distances, and therefore reducing emissions and greenhouse gases, thus curbing global warming. He concedes that living at higher densities will have implications for individual lifestyles. By reducing consumption of fossil fuels, he argues, urban residents could enjoy, amongst other things, lower transport expenditure, less pollution and lower heating costs.

Urban densities

Much of the technical case for compact cities has revolved around lower levels of travel and hence lower fuel consumption and emissions, associated with high urban densities. Central to the debate has been the work of the Australian academics Newman and

Kenworthy. For a number of large cities around the world, they have related higher densities with lower fuel consumption. The cities with the lowest densities, and hence the highest consumption rates, were in the United States. European cities were relatively efficient. People living in the lowest densities travel twice as far by car each week as those living at the highest densities.

Bourne suggests that urban sprawl continues to aggravate transportation problems. Bourne is unwilling to allow market planning to determine the future form and health of cities. He suspects that the continued promotion of urban dispersal will contribute to "*the evolution of future urban forms that are increasingly inefficient and socially inequitable*" (quoted in Jenks, 1996: 25).

Urban density achieves both a reduction of car use and at the same time maintains vitality in the urban environment, it can also increase safety by making the urban form more inhabited. Density determines the accessibility of people to people, of people to work, of people and recreation, it allows urban relationships to flourish. Interaction with a large number and variety of people and groups is at the core of the concept of communities, that is, organisations with sustained interpersonal relationships, as Lozano argues: "*interactions are the basis for the formation and continued existence of social organisation*" (Lozano 1990: 163). He adds that urban interaction is equalled with communication. Traditionally, the interactions of a population within an area were based on spatial proximity, that is, on personal communication.

Urban intensification

The term 'urban intensification' is widely used within discussion of urban form to relate to the range of processes which make an area more compact (Jenks 1996). Roseth

describes intensification in terms of urban 'consolidation', which he defines as "*the increase of population and/ or dwellings within a defined urban area*". Roseth's distinction of an increase of both population and built form is useful here, as many of the arguments indicating the link between compact urban living and sustainability rely heavily on higher densities of people, as well as buildings (Ibid).

Built form intensification comprises: redevelopment of existing buildings or previously developed sites, at higher densities; sub-division or conversion of buildings; buildings of additions or extensions to existing structures; and development on previously undeveloped urban land. Activity intensification is defined as: the increased use of existing buildings or site, change of use, which lead to an increase in activity and increases in the numbers of people living in, working in, or travelling through an area (Ibid).

Housing density

Another key precondition of the compact city is that development should be high density. It is generally accepted (by organisations such as Friends of the Earth) that a net residential density of about 300 people per hectare (pph) is sustainable (Jenks 1996: 129), new residential development in England tends to be in the region of 50-90 pph. Approximately half of developers believed that high density schemes are often rejected because planners take the view that developers are only interested in trying to extract the maximum level of profit from a site (Ibid).

Home-Work Relationships

The separation of workplaces from residential areas, forced by large-scale homogeneity and segregation, means that very few people can walk to work. In addition, because of

the low density prevalent in many residential suburban areas, people have no way of getting to work except by car.

Homogeneity and segregation

Land use is the most basic variable determining the form of a community (Lozano, 1990: 131). In many industrialised cities, such as Ottawa, the process of urban development have advanced far beyond the functional requirements of various activities. In most downtown's, life stops at the end of the working day because there are no downtown residential areas; most residential areas are socially homogeneous zones, where people of the same social class are segregated from the rest of the population. Present day segregation and homogeneity in land use are forced upon most members of a population regardless of their individual wishes and choices. Furthermore, segregated area are much larger today than they were in pre-industrial cities, and homogeneity is extended to practically every activity, leading to a reduction in social exchange. Thus, the most precious characteristics of urbanity[1], that is, choice and interaction, are being lost in a society with the highest potential to achieve them.

Causes of segregation and homogeneity

Land use segregation is not only the result of planning practices; it also appears to be responsive to some cultural requirements found in urban areas of industrialised countries, especially in Northern America (Canada). The basic characteristic of these cities, that of being formed by the aggregation of large zones of homogeneous use, can be traced to the effects of socio-cultural preferences, formalised and reinforced by the planning profession. The most common planning tool, zoning, is, of course, ideally

[1] Urbanity is the quality of a civilised community. It is characterised mainly by choices a civilised community offers its citizen a range of lifestyles and is expressed in ritualised behaviour and symbols.

suited to the enforcement of land use segregation (Lozano, 1990: 139). The demand for segregation lies at the core of a society's cultural norms.

Transport

Transport is closely bound up with the arguments for achieving quality high-density environments. An important potential strength of towns and cities is their ability to provide for the movement needs of people with reasonably full lives, without the car being as essential as it is. In the outer suburbs and the countryside. The effect of this can be seen in the Census of Population car ownership patterns in London where some households clearly choose not to have a car even where they could afford it. This is partly because of the difficulties in parking and garaging cars. But it is also partly because public transport meets many more of the daily movement needs (Jenks 1996).

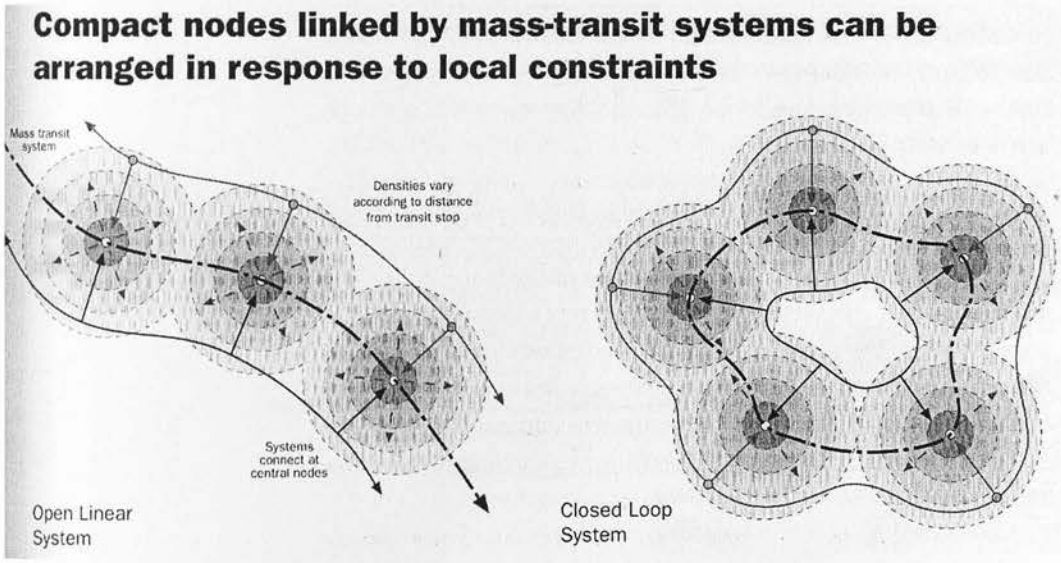


Figure 6.58 Compact nodes and mass-transit (Source Rogers, R 1997: 39).

Mass transit systems

Mass transit systems can provide high-speed cross-town travel by linking one neighbourhood centre with another. This reduces the volume and impact of through

traffic, which can be calmed and controlled particularly around the public heart of neighbourhoods (Rogers 1997).

Information technology

The effect of the Information age on our lives today and in the future is the subject of extensive debate. A fundamental evolution of our lifestyle and hence our built environments are expected by many. These changes are expected in the form of less reliance on physical transport and commuting, to a dependence on electronic transport of information on an "information super highway", instead of an automobile highway. Information technologies may increase the potential of home/work co-existence. Many companies are currently transforming many of their office staff to home/work basis through the aid of information technology.

Transport Satisfaction	Very Satisfied		Fairly Satisfied		Neither satisfied/dissat		Fairly Dissatisfied		Very Dissatisfied	
	Edin	Ottawa		Ottawa		Ottawa		Ottawa		Ottawa
Count	4	7	23	14	3	7	4	2	3	1
%	7 %	19 %	42 %	38 %	5 %	19 %	7 %	5 %	5 %	3 %
Energy Transport										
Count	1	5	14	14	11	7	6	6	4	-
%	2 %	13.5 %	25 %	38 %	20 %	19 %	11 %	16 %	7 %	-
Facilities										
Count	6	7	15	16	8	7	4	1	3	3
%	11 %	19 %	27 %	43 %	15 %	19 %	7 %	3 %	5 %	8 %
Location of Work place										
Count	5	11	31	11	7	10	4	2	1	1
%	9 %	30 %	56 %	30 %	13 %	27 %	7 %	4 %	2	3 %
Salary Satisfaction										
Count	3	-	12	9	13	10	7	8	5	9
%	6 %	-	22 %	24 %	24 %	27 %	13 %	14.5 %	9 %	24 %

Edinburgh
Ottawa

Table 6.14 Neighbourhood evaluation

6.24-Conclusion

Most of the samples in Edinburgh were fairly satisfied with their neighbourhood. The Edinburgh sample, through observation, is more appreciative of mixed use than in Ottawa. A good mixed use and high density often go together as do sprawl and homogeneity of use. High density living and mixed-use achieve some social goals of sustainability in that they create an urban vitality and promote social cohesion which contribute to sustaining the urban systems.

The majority of the interviewees in Edinburgh were fairly satisfied with social interaction. The physical form plays a significant role in the satisfaction of important human values, which have to do with relations to other people. Social interactions between members of the community contribute to fulfilling social goal of sustainability. Enhancing social interaction enhances the cohesion between people which will contribute as well to the improvement of the quality of life. Cars obstruct the pursuit of social objectives. They are noisy and intrusive, they carve up neighbourhoods and they encourage fear and isolation.

Walking was the most important mode of transport to fulfil daily needs in the Edinburgh sample. Transportation and land-use are inextricably linked to each other and to the ultimate of human settlement. In addition, a sustainable system should seek to minimise the impact of development on the natural environment by promoting higher density development, more compact community form, and greater physical integration of land uses.

In short, the primary impact of a sustainable urban system will be a dramatic reduction in the number of private cars, a reduction in the number of automobile trips, and a

decrease in the total vehicle miles travelled. Pedestrians are catalysts that make the essential qualities of communities meaningful. They create the place and time for casual encounters and the practical integration of diverse places and people. Cycling is an increasingly important element in transportation strategies to achieve sustainable development. It offers health, environmental, economic and other benefits. It is suitable for many local journeys and can be used in combination with public transport for longer trips.

Time spent for daily commuting to work is higher in Ottawa than in Edinburgh. Reduction in commuting time and commuting distance contributes to sustainability. Increasing speed increases the distances people travel. As the time people spend travelling remains constant, higher speeds generate suburban sprawl further from where people work, and regional shopping centres further from where shoppers live. Time is a valuable resource which should be conserved so that it can produce socially useful products. One way to reduce travel needs would be to bring homes, jobs and services together in a relatively compact urban centre to achieve a high level of accessibility with little need for movement and to promote a sustainable living. An alternative way to reduce the physical separation of activities is to decentralise some jobs and services and relate them to residential areas, either within a single large urban area.

The location of the work place is a contributor towards sustainable urban system. Rather than having employment close to living places, cities begun to sprout, particularly in Ottawa, low-density employment belts dispersed along highways.

The effect of low density on transportation is visible in the act of daily commuting in Ottawa. The separation of work place from residential area, forced by large-scale land

use segregation, means that very few people can walk to work. Higher mixed densities could be associated with reduction in travel demand and the encouragement of shifts towards emission-efficient modes. Higher density patterns of development tend to reduce average distances between place of residence and the places at which services, employment or other opportunities can be accessed.

Ottawa is based upon intensive use of the private car. This has resulted in the segregation of activities and land use. Such forms of development are inherently unsustainable as they lead to the increased use of private transport, which is energy demanding, and are also not easily attained by the whole population. Unity within the built environment has been badly affected by the concepts of car domination and traffic segregation. It is important to re-establish humane public spaces. Politicians, traffic engineers and planners must stop giving priority to the motor car and assisting the destruction of the environment. Another effect of segregation is the separation between home and work.

The next chapter is a detailed analysis using correlation and factor analysis, it will enable the researcher to have a better understanding how variables are inter- related to each other.

Chapter 7

Correlation and Factor Analysis

CHAPTER 7
CORRELATION AND FACTOR ANALYSIS

7.1-Introduction

Figure 7.1 Edinburgh's old town, Victoria Street. (Source the author 00)

Correlation is used to find an association between two variables that is, not whether one variable causes another, but simply whether they share any patterns of variation. Correlation is the measure and study of two variables which lead to the discovery of direct, causal connections between variables.

The Correlation Analysis is divided into two parts, one for the case of Edinburgh and the second for the case of Ottawa and will be followed by an interpretation.

7.2-Findings of the Correlation Analysis

Correlation Analysis was conducted for the two different samples of Edinburgh and Ottawa. This part describes the significant correlation between the variables used in the contexts that were observed in each setting.

According to the large numbers of correlations between variables observed as being significant, certain variables are chosen to be studied in a more comprehensive way to

facilitate and help the author to understand the main correlations in 'urban systems'. The following part looks at the case of Edinburgh.

7.3-Correlation Related to Home Satisfaction in Edinburgh

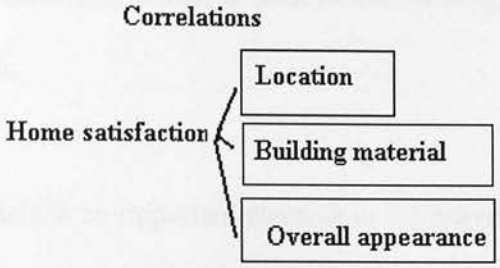


Figure 7.2 Correlation related to home satisfaction in Edinburgh (by the author)

Looking at the significance level we can see that the correlation between **home satisfaction** and **house location** is highly significant the Pearson correlation being r = 0.478 (53) P< 0.000. From this result we can say that home satisfaction and location are significantly positively correlated.

Figure 7.3 Victoria Street in Edinburgh (The Author 00)

The author of the research suggests that the satisfaction of the home is related to the location, which could be interpreted as being to close to amenities and facilities. As Edinburgh is characterised by a compact form, its main activities are within walking distance of the centre.

Home satisfaction and building materials

The Correlation between **home satisfaction** and **building material** is also highly significant, the Pearson correlation being $r = 0.311$ (53) $P < 0.000$.

Home satisfaction relates to building materials. In this case it could be interpreted as the satisfaction with local materials, which is used in old buildings, such as in the old and new town of Edinburgh.

The use of local materials is an important element in the movement towards sustainable construction (see Chapter 8).

Fairlie (1996) gives three reasons why the use of local materials should be encouraged: they are easily accessible, easily accountable and easily assimilable. Firstly, because of their accessibility, builders can avoid bringing materials great distances, which will reduce pressure on roads and cut carbon dioxide emissions. Secondly, local materials are accountable.

Reliant upon local resources for materials would ensure more responsible use. It would encourage people to use a wider range of materials such as straw, recycled paper insulation or earth.

Approaches to better buildings can include energy efficiency in equipping house, such as walls and loft insulation, draughtproofing and provision of solar panels for heating, choosing materials which are less energy-intensive to manufacture and recycling building materials.

Also important are building design and layout considerations, such as designing houses to capture solar energy in winter months and to provide cool, shaded spaces in summer months.

Correlation between **home satisfaction** and **overall appearance** is highly significant, the Pearson correlation being r = 0. 450 (53) P< 0.000.

The author suggest the overall appearance could be all the variables that are included in the satisfaction of the home, could be materials as well as location, in this case home satisfaction has correlated with the overall appearance.

Table 7.1 shows the correlation of different aspect of house satisfaction in terms of Location, overall appearance and building materials.

Correlations

		HOMESATI	HOUSELOC	OVERAPP	BUILDMAT	EXTERLAN	SPACIOUS	NEIGHSAT	SECURITY	STRETLIF	PRIVACY	VARUSES	SOCINTER	NEISATIS	SATISSUS	energy use on transport	satisfaction about variety of uses	work place satisfaction	salary satisfaction	job satisfaction
HOMESATI	Pearson Correlation	1.000	.478**	.450**	.311*	.335*	.326*	.597**	.435**	.358**	.334*	.382**	.283*	.620**	-.107	.339*	.181	.297*	.219	-.011
	Sig. (1-tailed)	.	.000	.000	.012	.006	.008	.000	.000	.004	.006	.004	.020	.000	.255	.020	.120	.019	.082	.471
	N	55	55	53	53	52	55	55	55	55	55	48	53	47	40	37	44	49	42	42
HOUSELOC	Pearson Correlation	.478**	1.000	.415**	.319*	.070	.258*	.442**	.411**	.215	.363**	.424**	.175	.574**	.113	.272	.146	.292*	.191	.247
	Sig. (1-tailed)	.000	.	.001	.010	.311	.029	.000	.001	.057	.003	.001	.105	.000	.244	.052	.172	.021	.113	.057
	N	55	55	53	53	52	55	55	55	55	55	48	53	47	40	37	44	49	42	42
OVERAPP	Pearson Correlation	.450**	.415**	1.000	.577**	.388**	.489**	.518**	.475**	.491**	.312*	.456**	.479**	.491**	.167	.428**	.118	.057	.314*	.242
	Sig. (1-tailed)	.000	.001	.	.000	.003	.000	.000	.000	.000	.011	.001	.000	.000	.158	.005	.229	.351	.024	.066
	N	53	53	53	51	50	53	53	53	53	53	46	51	45	38	35	42	47	40	40
BUILDMAT	Pearson Correlation	.311*	.319*	.577**	1.000	.477**	.410**	.483**	.405**	.357**	.199	.550**	.372**	.527**	-.057	.222	.266*	-.044	.196	-.055
	Sig. (1-tailed)	.012	.010	.000	.	.000	.001	.000	.001	.004	.077	.000	.004	.000	.366	.096	.042	.385	.110	.366
	N	53	53	51	53	50	53	53	53	53	53	46	51	46	39	36	43	47	41	41
EXTERLAN	Pearson Correlation	.335*	.070	.388**	.477**	1.000	.334*	.352**	.436**	.349**	.154	.096	.412**	.329*	-.090	.038	.054	.063	.113	-.012
	Sig. (1-tailed)	.008	.311	.003	.000	.	.008	.005	.001	.006	.137	.262	.001	.014	.296	.415	.368	.338	.240	.471
	N	52	52	50	50	52	52	52	52	52	52	46	50	45	38	35	42	47	41	41
SPACIOUS	Pearson Correlation	.326*	.258*	.489**	.410**	.334*	1.000	.557**	.322*	.355**	.231*	.337**	.362**	.460**	-.116	.164	.289*	.200	.345*	.171
	Sig. (1-tailed)	.008	.029	.000	.001	.008	.	.000	.008	.004	.045	.010	.004	.001	.238	.166	.028	.084	.013	.139
	N	55	55	53	53	52	55	55	55	55	55	48	53	47	40	37	44	49	42	42
NEIGHSAT	Pearson Correlation	.597**	.442**	.518**	.483**	.352*	.557**	1.000	.581**	.521**	.467**	.507**	.393**	.771**	-.139	.365*	.197	.141	.251	.039
	Sig. (1-tailed)	.000	.000	.000	.000	.005	.000	.	.000	.000	.000	.000	.002	.000	.195	.013	.100	.166	.054	.404
	N	55	55	53	53	52	55	55	55	55	55	48	53	47	40	37	44	49	42	42
SECURITY	Pearson Correlation	.435**	.411**	.475**	.405**	.436**	.322*	.581**	1.000	.324**	.356**	.326*	.205	.610**	-.249	.182	.122	.143	.201	.006
	Sig. (1-tailed)	.000	.001	.000	.001	.001	.008	.000	.	.008	.004	.012	.071	.000	.060	.141	.214	.164	.100	.484
	N	55	55	53	53	52	55	55	55	55	55	48	53	47	40	37	44	49	42	42
STRETLIF	Pearson Correlation	.358**	.215	.491**	.357**	.349*	.355**	.521**	.324**	1.000	.417**	.356**	.725**	.445**	.345*	.350*	.418**	.121	.404**	.141
	Sig. (1-tailed)	.004	.057	.000	.004	.006	.004	.000	.008	.	.001	.006	.000	.001	.015	.017	.002	.203	.004	.187
	N	55	55	53	53	52	55	55	55	55	55	48	53	47	40	37	44	49	42	42
PRIVACY	Pearson Correlation	.334*	.363**	.312*	.199	.154	.231*	.487**	.356**	.417**	1.000	.585**	.426**	.591**	.167	.434**	.011	.025	.190	-.055
	Sig. (1-tailed)	.006	.003	.011	.077	.137	.045	.000	.004	.001	.	.000	.001	.000	.151	.004	.471	.432	.114	.365
	N	55	55	53	53	52	55	55	55	55	55	48	53	47	40	37	44	49	42	42
VARUSES	Pearson Correlation	.382**	.424**	.456**	.550**	.096	.337**	.507**	.326*	.356**	.585**	1.000	.492**	.611**	.054	.502**	.249	.063	.109	-.091
	Sig. (1-tailed)	.004	.001	.001	.000	.262	.010	.000	.012	.006	.000	.	.000	.000	.380	.001	.063	.345	.263	.297
	N	48	48	46	46	46	48	48	48	48	48	48	48	42	35	33	39	43	36	37
SOCINTER	Pearson Correlation	.283*	.175	.479**	.372**	.412**	.362**	.393**	.205	.725**	.426**	.492**	1.000	.357*	.404**	.376*	.302*	-.003	.300*	.140
	Sig. (1-tailed)	.020	.105	.000	.004	.001	.004	.002	.071	.000	.001	.000	.	.008	.006	.013	.026	.492	.028	.191
	N	53	53	51	51	50	53	53	53	53	53	48	53	45	38	35	42	48	41	41
NEISATIS	Pearson Correlation	.620**	.574**	.491**	.527**	.329*	.460**	.771**	.610**	.445**	.591**	.611**	.357*	1.000	-.081	.296*	.199	.174	.243	-.058
	Sig. (1-tailed)	.000	.000	.000	.000	.014	.001	.000	.000	.001	.000	.000	.008	.	.312	.037	.109	.129	.065	.360
	N	47	47	45	46	45	47	47	47	47	47	42	45	47	39	37	40	44	40	40
SATISSUS	Pearson Correlation	-.107	.113	.167	-.057	-.090	-.116	-.139	-.249	.345*	.167	.054	.404**	-.081	1.000	.339*	.009	.186	.166	.203
	Sig. (1-tailed)	.255	.244	.158	.366	.296	.238	.195	.060	.015	.151	.380	.006	.312	.	.025	.480	.132	.174	.122
	N	40	40	38	39	38	40	40	40	40	40	35	38	39	40	34	35	38	34	35
energy use on transpo	Pearson Correlation	.339*	.272	.428**	.222	.038	.164	.365*	.182	.350*	.434**	.502**	.376*	.296*	.339*	1.000	-.115	-.044	.070	-.001
	Sig. (1-tailed)	.020	.052	.005	.096	.415	.166	.013	.141	.017	.004	.001	.013	.037	.025	.	.262	.400	.351	.498
	N	37	37	35	36	35	37	37	37	37	37	33	35	37	34	37	33	36	32	33
satisfaction about variety of uses	Pearson Correlation	.181	.146	.118	.266*	.054	.289*	.197	.122	.418**	.011	.249	.302*	.199	.009	-.115	1.000	.279*	.466**	.108
	Sig. (1-tailed)	.120	.172	.229	.042	.368	.028	.100	.214	.002	.471	.063	.026	.109	.480	.262	.	.039	.002	.268
	N	44	44	42	43	42	44	44	44	44	44	39	42	40	35	33	44	41	35	35
work place satisfaction	Pearson Correlation	.297*	.292*	.057	-.044	.063	.200	.141	.143	.121	.025	.063	-.003	.174	.188	-.044	.279*	1.000	.330*	.154
	Sig. (1-tailed)	.019	.021	.351	.385	.338	.084	.166	.164	.203	.432	.345	.492	.129	.132	.400	.039	.	.016	.165
	N	49	49	47	47	47	49	49	49	49	49	43	48	44	38	36	41	49	42	42
salary satisfaction	Pearson Correlation	.219	.191	.314*	.196	.113	.345*	.251	.201	.404**	.190	.109	.300*	.243	.166	.070	.466**	.330*	1.000	.495**
	Sig. (1-tailed)	.082	.113	.024	.110	.240	.013	.054	.100	.004	.114	.263	.028	.065	.174	.351	.002	.016	.	.001
	N	42	42	40	41	41	42	42	42	42	42	36	41	40	34	32	35	42	42	41
job satisfaction	Pearson Correlation	-.011	.247	.242	-.055	-.012	.171	.039	.006	.141	-.055	-.091	.140	-.058	.203	-.001	.108	.154	.495**	1.000
	Sig. (1-tailed)	.471	.057	.066	.366	.471	.139	.404	.484	.187	.365	.297	.191	.360	.122	.498	.268	.165	.001	.
	N	42	42	40	41	41	42	42	42	42	42	37	41	40	35	33	35	42	41	42

** Correlation is significant at the 0.01 level (1-tailed).

* Correlation is significant at the 0.05 level (1-tailed).

Table 7.1 Correlation table of variables used for the Edinburgh case

The correlation test on house satisfaction, location, material, overall satisfaction has shown a high significance of relation between variables.

7.4-Neighbourhood Satisfaction in Edinburgh

According to the large number of correlations between variables, certain variables have been chosen for their importance to be studied in a more detailed way as they contribute to social goals of sustainability see chapter 1. Those that are related to neighbourhood satisfaction are: street life, variety of facilities and social interaction (see fig 7.4).

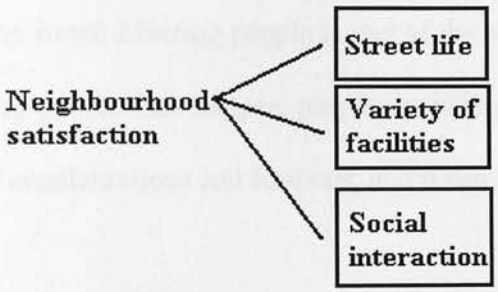


Figure 7.4 variables used for neighbourhood satisfaction (by the author)

Figure 7.5 The Grassmarket in Edinburgh (The author 00).

The correlation between **neighbourhood satisfaction** and **street life** is highly significant. The Pearson correlation is r = 0.521 (55) P< 0.000.

The authors suggest that in this case, the neighbourhood has correlated with street life. This indicates that people in Edinburgh choose their neighbourhood to be close to

street life. This could be related to security of the neighbourhood where people feel more secure and there is a sense of neighbourhood watch.

The correlation between **neighbourhood satisfaction** and **social interaction** is highly significant. The Pearson correlation is r = 0.393 (53) P< 0.002.

An enhanced social interaction strengthens social ties between members of the neighbourhood (see Chapter 1 section 1.7.2). The space society inhabits reflects this structure of interaction between individuals. Social interaction manifests itself in many forms, from the obvious gathering of people in clubs, pubs or cinemas to more subtle associations in the street. Meeting people is one of the society's customs and part of its tradition. Meeting people can happen purposely when one visits someone at home, meets at work or at celebrations and festivals, and it can happen by chance in a street.

Rapoport (1977) argues that social interaction and activities in settings depend on appropriate cues and their relation to unwritten rules. The built environment represents these cues in fixed feature space: sign, landscaping, shops, foods and other objects and furniture are semi-fixed feature space, while people's behaviour, rules and norms represent non-fixed feature space (Rapoport, 1977: 276).

The correlation between **neighbourhood satisfaction** and **variety of facilities** is highly significant. The Pearson correlation is r = 0.507 (48) P< 0.000.

The above result could be interpreted as the satisfaction of people in Edinburgh about their neighbourhood which is related to variety of facilities and activities in this case it

could be related to sustainability as activities and variety of facilities enhance social interaction between members of neighbourhood.

The purpose of shopping is to exchange goods, as it always has been. Shopping as an activity requires people to move of one from one place to another. Through this they are subjected to an enormous amount of information attracting one to buy things.

Shopping as an activity is performed in the commercial streets where people move from one shop to another looking at what they want or it may be in a closed space such as a shopping centre or a mall. Factors such as variety and activity are among the qualities that shopping centres have. They are only used by pedestrians, this which allows people to move freely from one shop to another without taking into consideration the danger they might be subjected to by vehicles.

Convenience is one of the factors that makes people prefer to do their shopping. Convenience comes from providing all the essentials such as parking places, transport and restaurants and cafes.

Correlation between home satisfaction and neighbourhood satisfaction

Home satisfaction and **neighbourhood satisfaction,** according to the analysis show a highly significant correlation $r = 0.597$ (55) $P < 0.000$.

The above results could be interpreted as the satisfaction of the home quality, which include materials and location. Home quality has correlated with the neighbourhood in people's perception in Edinburgh. The satisfaction of the neighbourhood is directly

related to the satisfaction of the home, in another word sustaining the home could have an impact on the neighbourhood and vice versa.

Rapoport (1977) defines neighbourhood as having three major elements: socio-cultural characteristics and criteria; the location and use of various services, facilities and activities, and, thirdly, the physical environment and its symbolic meaning.

Socio-cultural characteristics affect the importance attached to the local area and its services, and hence to the neighbourhood, so that the meaning of a social area depends on them. The time spent within an area also affects the importance attached to it and hence its definition vis-à-vis other areas. Thus women frequently define neighbourhood differently than do men. The length of the journey to work affects the time spent in an area and hence its definition.

An important role is played by the neighbourhood quotient, which describes the residents' use of local facilities and the degree of involvement. These vary with class, age, length of residence and type of housing. Among important social variables are friendship networks within the locality (Rapoport, 1977).

Size and importance vary with the neighbourhood quotient and this relates to particular groups and as well as individuals (Rapoport 1977: 165). Lower income groups tend to have smaller neighbourhoods so that, in Britain, middle class people have neighbourhoods larger than 100 acres, which may be related to mobility, lifestyle and extensiveness of social network (Rapoport 1977: 165).

The correlation between **home location** and **street life** is not highly significant. The Pearson correlation is r = 0.215 (55) P< 0.057.

We can conclude from the above correlation that the choice of the location is not related to street life for the samples of Edinburgh. Home location could be related indirectly to street life.

The correlation between **home location** and **variety of facilities** is highly significant. The Pearson correlation is r = 0.424 (48) P< 0.001.

As home location is correlated with variety of facilities, it could be interpreted that the choice of the location in people's perception is mainly related to their desire to be near facilities which could encourage interaction therefore contribute to social goals of sustainability.

Location

The distribution of different activities in the city and their locations has a significant impact on distance and energy consumption. Dispersed distribution has very serious implications for energy and environmental conservation, because mass transit cannot be extended to dispersed residential or employment areas, transportation is provided largely by private cars, which consume huge amounts of energy and are the main contributor to air pollution.

Accessibility plays a critical role in the distribution of urban elements. On the metropolitan scale, a key factor is the location of basic employment, which influences the location of other elements. The relationship between employment and residential

areas is established through the urban transportation system. Residential location usually follows employment. People, who cannot afford expensive trips and frequently change jobs, locate near employment centres.

Correlation between overall home satisfaction and neighbourhood variables

Figure 7.6 Mixed facilities in Edinburgh. George IV Bridge (the author 00)

The correlation between **overall home satisfaction** and **street life** is highly significant. The Pearson correlation is $r = 0.358$ $P < 0.004$.

The author suggests that the overall satisfaction of the home could be related to the choice of people where street life is found, it could be for security reasons as people prefer busy areas than segregated or it might be for social interaction therefore it contribute into sustaining the urban environment.

The correlation between **overall home satisfaction** and **variety of facilities** is highly significant. The Pearson correlation is $r = 0.382$ $P < 0.004$.

As in location overall home satisfaction correlates with variety of facilities, It could be seen that people prefer to be closer to amenities and facilities, which favour interaction. Being close to facilities also encourages less use of car, therefore causing less impact on the environment. It could be interpreted as Edinburgh is being a compact form where activities are within walking distance.

The correlation between **overall home satisfaction** and **social interaction** is highly significant. The Pearson correlation is r= 0.283 (53) P< 0.020.

As mentioned earlier the overall home satisfaction has correlated with variety of facilities, the same variable has correlated with social interaction it can be concluded in this case that variety of facilities and social interaction are correlated. In term of sustainability facilitating variety of facilities can encourage social interaction between members of the community therefore both variables contribute into social goals of sustainability.

Correlation between home satisfaction and work place satisfaction

Figure 7.7 Daily transport to work in Edinburgh Princess Street (the author 00)

The correlation between **overall home satisfaction** and **work place** satisfaction is highly significant. The Pearson correlation is r= 0.297 (49) P< 0.019.

The above variable could be interpreted as the indication that the satisfaction of the home is highly related to the work place. It could be seen as one of the main contributors to sustaining urban systems. Being close to the work place has an impact on transport, time, distance and pollution. On transport because the need for transport is reduced by travel distance, so people go to work by walking or cycling. With only short distance needed to travel to work, time is also saved.

The correlation between **home location** and **job satisfaction** is not highly significant. The Pearson correlation is r = 0.247 P< 0.057

In the above case the type of job is not significant in another word the choice of the home location is not affected by the satisfaction of the job in people's perception in Edinburgh.

The correlation between **home location** and **salary** is not highly significant. The Pearson correlation is r =0.191 (42) P<0.113

The above variable could be interpreted as the indication that the satisfaction of home location do not have a direct effect on the salary and the type of job.

The correlation between **home location** and **work place location** is highly significant. The Pearson correlation is r = 0.292(49) P< 0.021.

The above correlation is a contributor to sustaining the urban system, and the urban form. As seen previously, home satisfaction has correlated with work place, it can be explained as the desire of people's about their home location to be near their work, therefore people will not have to travel longer distances and spending time on transport. It could be economical and therefore contribute into sustaining the economy of the city.

Correlation between **home location** and **energy use for transport** is not highly significant. The Pearson correlation is r = 0.272 (37) P< 0.052.

Energy use for transport is not affected by home location, it could be interpreted as people use less car, or more public transport and walking for their everyday life. This explains the nature of the urban form in Edinburgh which encourages walking as different activities are within walking distance.

Figure 7.8 Daily transport in Edinburgh Princes street (The author 00)

The correlation between **work place satisfaction** and **energy use on transport** is not significant r=-0.044 (36) P<0.400

The author of the research suggest that the satisfaction of the work place is not related to energy use on transport in people's perception.

The correlation between **work place** and **salary** is highly significant. The pearson correlation is r=0.330 (42) P<0.016

The above correlation is a contributor in understanding how to sustain urban systems. People's perception in Edinburgh work place has correlated with their satisfaction with the salary, in another word people desire to be close to work could be for economic reason, as seen in the correlation.

Summary

In people's perception in Edinburgh Home satisfaction has correlated with house location. The satisfaction of the home is related to the location, which could be interpreted as being to close to amenities and facilities. As Edinburgh being characterised by a compact form main activities are within walking distance. The relationships between location and home are a contributor toward sustaining the urban systems. Correlation between home satisfaction and building material is also highly significant. Home satisfaction relates to building materials, in this case it could be interpreted as the satisfaction with local materials, which is used in old buildings, such as the old town of Edinburgh. Use the local materials in buildings contribute to sustaining the local architecture. The use of local materials is an important element in the movement towards sustainable construction. Reliant upon local resources for materials, would ensure more responsible use.

The correlation between neighbourhood satisfaction and street life is also highly significant. People in Edinburgh choose their neighbourhood to be close to street life. This could be related to security of the neighbourhood where people feel more secure and there is a sense of neighbourhood watch. The correlation between neighbourhood satisfaction and social interaction is highly significant. Social interaction contributes to social goals of sustainability and enhancing social interaction will enhance social ties between members of the neighbourhood.

Neighbourhood satisfaction has correlated variety of facilities is highly significant. Promoting variety of facilities and activities contribute to sustainability as activities and variety of facilities enhance social interaction between members of neighbourhood.

Home satisfaction and neighbourhood satisfaction, according to the analysis show a highly significant correlation. The satisfaction of the neighbourhood is directly related to the satisfaction of the home, in another word sustaining the home could have an impact on the neighbourhood and vice versa.

The correlation between overall home satisfaction and work place satisfaction is highly significant. Satisfaction of the home is highly related to the work place. It could be seen as one of the main contributor to sustaining the urban systems. Being close to the work place will have an impact on transport, time, distance and pollution. The correlation between home location and work place location is highly significant. The above correlation is a contributor to sustaining the urban system, and the urban form. As seen previously, home satisfaction has correlated with work place, it can be explained as the desire of people's about their home location to be near their work, therefore people will not have to travel longer distances and spending time on transport. It could be economical and therefore contribute into sustaining the economy of the city.

Correlation between home location and energy use for transport is not highly significant. Energy use didn't affect on the location of home, it could be interpreted as people use less car, or more public transport and walking for their everyday life. This explains the nature of the urban form in Edinburgh which encourage walking as different activities are within walking distance.

This second part of the Correlation Analysis focuses on the city of Ottawa:

Correlations

		HOMESATI	HOUSELOC	OVERAPP	BUILDMAT	SPACIOUS	NEIGHSAT	STRETLIF	PRIVACY	VARUSES	SOCINTER	NEISATIS	SATISSUS	energy use on transport	satisfaction about variety of uses	work place satisfaction	salary satisfaction	job satisfaction
HOMESATI	Pearson Correlati	1.000	.297*	.810**	.477**	.439*	.617**	.423*	.414**	.128	.504**	.478**	.261	.161	.174	-.047	.421**	-.194
	Sig. (1-tailed)	.	.041	.000	.002	.009	.000	.005	.005	.225	.001	.001	.059	.174	.151	.393	.005	.128
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
HOUSELOC	Pearson Correlati	.297*	1.000	.671**	.413*	.380*	.710**	.561**	.792**	-.114	.125	.859**	.265	.332*	.372*	.418**	.482**	.002
	Sig. (1-tailed)	.041	.	.000	.007	.021	.000	.000	.000	.258	.236	.000	.062	.027	.014	.006	.002	.496
	N	35	35	32	35	29	35	35	35	35	35	35	35	34	35	35	35	35
OVERAPP	Pearson Correlati	.810**	.671**	1.000	.613**	.455**	.795**	.479**	.687**	-.088	.437**	.677**	.089	.134	.223	.002	.459**	-.189
	Sig. (1-tailed)	.000	.000	.	.000	.007	.000	.003	.000	.315	.006	.000	.314	.236	.110	.496	.004	.150
	N	32	32	32	32	29	32	32	32	32	32	32	32	31	32	32	32	32
BUILDMAT	Pearson Correlati	.477**	.413*	.613**	1.000	.583**	.559**	.376*	.379*	.349*	.743**	.423**	-.095	-.156	.310*	.081	.443**	-.339*
	Sig. (1-tailed)	.002	.007	.000	.	.000	.000	.013	.012	.020	.000	.006	.293	.189	.035	.321	.004	.023
	N	35	35	32	35	29	35	35	35	35	35	35	35	34	35	35	35	35
SPACIOUS	Pearson Correlati	.439*	.380*	.455**	.583**	1.000	.253	.450**	.492**	.227	.154	.569**	.376*	.289	.506**	.300	.474**	-.234
	Sig. (1-tailed)	.009	.021	.007	.000	.	.093	.007	.003	.118	.213	.001	.022	.068	.003	.057	.005	.111
	N	29	29	29	29	29	29	29	29	29	29	29	29	28	29	29	29	29
NEIGHSAT	Pearson Correlati	.617**	.710**	.795**	.559**	.253	1.000	.416**	.559**	-.108	.358*	.619**	.072	.066	.198	.220	.494**	-.013
	Sig. (1-tailed)	.000	.000	.000	.000	.093	.	.005	.000	.262	.015	.000	.335	.352	.120	.099	.001	.470
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
STRETLIF	Pearson Correlati	.423**	.561**	.479**	.376*	.450**	.416**	1.000	.591**	.207	.407**	.514**	.080	.424**	-.045	.025	.218	-.093
	Sig. (1-tailed)	.005	.000	.003	.013	.007	.005	.	.000	.109	.006	.001	.319	.005	.396	.443	.101	.295
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
PRIVACY	Pearson Correlati	.414**	.792**	.687**	.379*	.492**	.559**	.591**	1.000	.351*	.374*	.591**	.308*	.550**	.256	.209	.398*	.041
	Sig. (1-tailed)	.005	.000	.000	.012	.003	.000	.000	.	.017	.011	.000	.032	.000	.063	.110	.008	.405
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
VARUSES	Pearson Correlati	.128	-.114	-.088	.349*	.227	-.108	.207	.351*	1.000	.604**	.071	.181	.376*	.230	.072	.169	-.170
	Sig. (1-tailed)	.225	.258	.315	.020	.118	.262	.109	.017	.	.000	.339	.141	.012	.086	.337	.162	.161
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
SOCINTER	Pearson Correlati	.504**	.125	.437**	.743**	.154	.358*	.407**	.374*	.604**	1.000	.240	-.005	.116	.093	-.126	.220	-.229
	Sig. (1-tailed)	.001	.236	.006	.000	.213	.015	.006	.011	.000	.	.076	.487	.251	.291	.232	.099	.090
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
NEISATIS	Pearson Correlati	.478**	.859**	.677**	.423**	.569**	.619**	.514**	.591**	.071	.240	1.000	.367*	.368*	.298*	.449**	.418**	-.025
	Sig. (1-tailed)	.001	.000	.000	.006	.001	.000	.001	.000	.339	.076	.	.013	.014	.037	.003	.006	.443
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
SATISSUS	Pearson Correlati	.261	.265	.089	-.095	.376*	.072	.080	.308*	.181	-.005	.367*	1.000	.475**	.581**	.325*	.078	.098
	Sig. (1-tailed)	.059	.062	.314	.293	.022	.335	.319	.032	.141	.487	.013	.	.002	.000	.026	.326	.285
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
energy use on transp	Pearson Correlati	.161	.332*	.134	-.156	.289	.066	.424**	.550**	.376*	.116	.368*	.475**	1.000	.295*	.169	.012	-.137
	Sig. (1-tailed)	.174	.027	.236	.189	.068	.352	.005	.000	.012	.251	.014	.002	.	.041	.166	.474	.217
	N	36	34	31	34	28	36	36	36	36	36	36	36	36	36	35	35	35
satisfaction about variety of uses	Pearson Correlati	.174	.372*	.223	.310*	.506**	.198	-.045	.256	.230	.093	.298*	.581**	.295*	1.000	.372*	.465**	-.275
	Sig. (1-tailed)	.151	.014	.110	.035	.003	.120	.396	.063	.086	.291	.037	.000	.041	.	.013	.002	.052
	N	37	35	32	35	29	37	37	37	37	37	37	37	36	37	36	36	36
work place satisfactio	Pearson Correlati	-.047	.418**	.002	.081	.300	.220	.025	.209	.072	-.126	.449**	.325*	.169	.372*	1.000	.202	.127
	Sig. (1-tailed)	.393	.006	.496	.321	.057	.099	.443	.110	.337	.232	.003	.026	.166	.013	.	.119	.230
	N	36	35	32	35	29	36	36	36	36	36	36	36	35	36	36	36	36
salary satisfaction	Pearson Correlati	.421**	.482**	.459**	.443**	.474**	.494**	.218	.398**	.169	.220	.418**	.078	.012	.465**	.202	1.000	-.181
	Sig. (1-tailed)	.005	.002	.004	.004	.005	.001	.101	.008	.162	.099	.006	.326	.474	.002	.119	.	.146
	N	36	35	32	35	29	36	36	36	36	36	36	36	35	36	36	36	36
job satisfaction	Pearson Correlati	-.194	.002	-.189	-.339*	-.234	-.013	-.093	.041	-.170	-.229	-.025	.098	-.137	-.275	.127	-.181	1.000
	Sig. (1-tailed)	.128	.496	.150	.023	.111	.470	.295	.405	.161	.090	.443	.285	.217	.052	.230	.146	.
	N	36	35	32	35	29	36	36	36	36	36	36	36	35	36	36	36	36

*. Correlation is significant at the 0.05 level (1-tailed).

**. Correlation is significant at the 0.01 level (1-tailed).

Table 7.2 Correlation table of variables used for the Ottawa case

7.5-Correlation related to Home Satisfaction in Ottawa

Figure 7.9 Housing type in Ottawa.

(The author 00)

Looking at the significance level it can be concluded that the correlation between the two variables **home satisfaction** and **house location** is significant. The Pearson correlation is r = 0.297 (35) P< 0.041.

From this result we could say that home

satisfaction and location are correlated. It could be interpreted as people's satisfaction in their home is related to house location.

7.6-Satisfaction with the neighbourhood in Ottawa

Figure 7.10 A neighbourhood in Ottawa Waverley st (The author 00)

The correlation between **Neighbourhood satisfaction** and **street life** is not significant. The Pearson correlation is r=0.416 (37) P< 0.005.

The correlation above could be interpreted as street life not being a factor of satisfaction for the neighbourhood in Ottawa.

The correlation between **Neighbourhood satisfaction** and **social interaction** is significant. The Pearson correlation is r = 0.358 (37) P< 0.015.

In this case the satisfaction of the neighbourhood is related to social interaction, social interaction between individuals of the neighbourhood encourage social ties and fulfil social goals of sustainability.

Correlation between home satisfaction and neighbourhood satisfaction

Regarding **Home satisfaction** and **neighbourhood satisfaction**, the analysis shows a highly significant correlation between both variables. The Pearson correlation r = 0.617 (37) P< 0.000.

Correlation between home location and neighbourhood variables

Figure 7.11 The market place in Ottawa. (The author 00)

The correlation between **home location** and **street life** is highly significant. The Pearson correlation is r = 0.561 (35) P< 0.000.

In this case the location of the home could be determined by street life which could be interpreted as people in Ottawa tend to locate their home close to street life.

The correlation between **home location** and **variety of facilities** is not significant. The Pearson correlation is r = - 0.114 P< 0.258.

The result could be interpreted as showing that the choice of the location of the home is not driven by the choice of variety of facilities. This would reflect the structure of Ottawa which is characterised by the separation between the home and urban facilities. Equally the Correlation between **home location** and **social interaction** is not significant. The Pearson correlation is r = 0.125 P< 0.236.

Correlation between overall home satisfaction and **neighbourhood variables in Ottawa**

The correlation between overall **home satisfaction** and **street life** is not significant. The Pearson correlation is r = 0.423 (37) P< 0.005.

The author of the research suggests that the satisfaction of the home is not related to the street life, it could be interpreted as in people's perception the satisfaction of the home is related to other aspects.

The correlation between overall **home satisfaction** and **variety of facilities** is not significant. The Pearson correlation is r = 0.128 (37) P< 0.225.

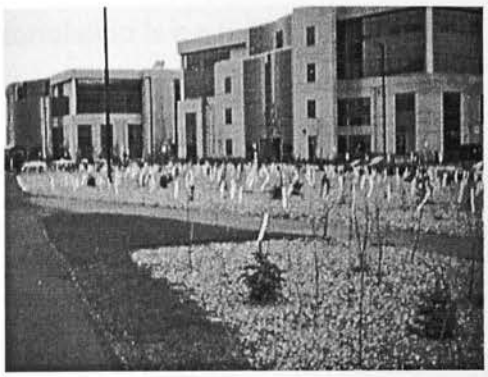


Figure 7.12 A high tech firm in Ottawa's fringe (The author 00).

The correlation between **overall home satisfaction** and **social interaction** is highly significant. The Pearson correlation is r= 0.504 (37) P< 0.001.

The author of the research suggests that the satisfaction of the overall home is not related to the social interaction.

Correlation related to Satisfaction with the Work place

The correlation between **work place** satisfaction and **salary** is not significant. The Pearson correlation is r = 0.202 (36) P< 0.119.

Figure 7.13 Urban fringe in Ottawa (The author 00).

The author of the research suggests that the satisfaction of the work place is not related to the salary.

The correlation between **workplace satisfaction** and **satisfaction with the job** is not significant. The Pearson correlation

is r = 0.127 (36) P< 0.230.

The above correlation did not show a correlation between the work place and the job type, in this case the type of job does not affect the satisfaction of the work place.

Correlation between home satisfaction and work place satisfaction

The correlation between **home location** and **salary** is highly significant. The Pearson correlation is r = 0.482 (35) P< 0.002.

The correlation above could show a link between salary and home location, it could be stress the importance of the economic factor in determining the home location in Ottawa

The correlation between **home location** and **work place location** is not significant. The Pearson correlation is r =0 418 P< 0.006.

The above result could be interpreted as one of the contributors of sustaining the urban system. Home location and work place location did not correlate, similar to the previous correlation, longer distance to work and home which characterised Ottawa favorise longer distance, time and waste of energy as well as environmental problems such as pollution.

The correlation between **home location** and **energy use for transport** is significant. The Pearson correlation is r = 0.332 (34) P< 0.027.

The author of the research suggests that the satisfaction of the home location is related to energy use for transport.

The correlation between **work place satisfaction** and **energy use on transport** is not significant. The Pearson correlation is r = 0.169 (35) P< 0.166. The author of the research suggests that the satisfaction of the work place is not related to energy use on transport.

Summary of the Correlation analysis related Ottawa

Looking at the significance level it can be concluded that the correlation between the two variables home satisfaction and house location is significant. From this result we could say that home satisfaction and location are correlated. It could be interpreted as people's satisfaction in their home is related to house location.

In people's perception of Ottawa the correlation between Neighbourhood satisfaction and street life is not significant. The correlation above could be interpreted as street life not being a factor of satisfaction for the neighbourhood in Ottawa.

The correlation between Neighbourhood satisfaction and social interaction is significant. In this case the satisfaction of the neighbourhood is related to social interaction, social interaction between individuals of the neighbourhood encourage social ties and fulfil social goals of sustainability.

Regarding Home satisfaction and neighbourhood satisfaction, the analysis shows a highly significant correlation between both variables. The correlation between home location and street life is also highly significant. In this case the location of the home could be determined by street life which could be interpreted as people in Ottawa tend to locate their home close to street life.

The correlation between home location and variety of facilities is not significant. The result could be interpreted as showing that the choice of the location of the home is not driven by the choice of variety of facilities. This would reflect the structure of Ottawa which is characterised by the separation between the home and urban facilities.

The correlation between overall home satisfaction and street life is not significant. The author of the research suggests that the satisfaction of the home is not related to the street life, it could be interpreted as in people's perception the satisfaction of the home is related to other aspects.

The correlation between work place satisfaction and salary is not significant. The author of the research suggests that the satisfaction of the work place is not related to the salary. The correlation between workplace satisfaction and satisfaction with the job is not significant. The above correlation did not show a correlation between the work place and the job type, in this case the type of job does not affect the satisfaction of the work place.

The correlation between home location and salary is highly significant. The correlation above could show a link between salary and home location, it could be stress the importance of the economic factor in determining the home location in Ottawa

The correlation between home location and work place location is not significant. The above result could be interpreted as one of the contributors of sustaining the urban system. Home location and work place location did not correlate, similar to the previous correlation, longer distance to work and home which characterised Ottawa favorise

longer distance, time and waste of energy as well as environmental problems such as pollution.

In people's perception in Ottawa the correlation between work place satisfaction and energy use on transport is not significant. The author of the research suggests that the satisfaction of the work place is not related to energy use on transport.

Variables	Edinburgh	Ottawa	*Variables*	Edinburgh	Ottawa
Home satisfaction x home location	**(Sig)** P< 0.000	**(Sig)** P< 0.041	Neighbourhood satisfaction x street life	**(Sig)** P< 0.000	**(Sig)** P< 0.005
Home satisfaction x satisfaction facilities	**(Sig)** P< 0.000	(Not sig) P< 0.225	Neigh satisfaction x social interaction	**(Sig)** P< 0.002	**(Sig)** P< 0.015
Home satisfaction x overall appearance	**(Sig)** P< 0.000	**(Sig)** P< 0.000	Neigh satisfaction x work place	**(Sig)** P< 0.000	(Not sig) P< 0.99
Home satisfaction x variety of uses	**(Sig)** P< 0.004	(Not sig) P< 0.225	Social interaction x street life	**(Sig)** P< 0.000	**(Sig)** P< 0.006
Home satisfaction x work place	**(Sig)** P< 0.019	(Not sig) P< 0.393	Work place satisfaction x salary	**(Sig)** P< 0.016	(Not sig) P< 0.119
Home location x social interaction	(Not sig) P< 0.105	(Not sig) P< 0.236	Work place satisfaction x job satisfaction	(Not sig) P< 0.165	(Not sig) P< 0.230
Home location x satisfaction facilities	**(Sig)** P< 0.001	(Not sig) P< 0.258	Work place x energy on transport	(Not sig) P< 0.400	(Not sig) P< 0.166
Neighbourhood satis x home satisfaction	**(Sig)** P< 0.000	**(Sig)** P< 0.001	Home location x salary satisfaction	(Not sig) P< 0.113	**(Sig)** P< 0.002
Neighbourhood satisf x variety uses	**(Sig)** P< 0.000	(Not sig) P< 0.262	Home location x work place satisfaction	**(Sig)** P< 0.021	**(Sig)** P< 0.006

Table 7.3 Correlation table for both settings Edinburgh and Ottawa

7.7-Conclusion of the Correlation Analysis

When carrying out the Correlation Analysis of Edinburgh and Ottawa the author explained each case study separately. In the following part, the author formulates general conclusions, which explain the variations between the two. It is apparent that the case study of Edinburgh gives testimony to the close relationships between home satisfaction and work place ($P< 0.019$) which contribute to sustainability and sustaining the urban systems.

In Edinburgh, home satisfaction mainly correlates with location, overall appearance and street life **(Table 7.3)**. Neighbourhood satisfaction mainly correlates with social interaction, variety of facilities and with work place. Overall home satisfaction correlates with street life, home satisfaction correlates with facilities. The result showed a high correlation in Edinburgh between home satisfaction, neighbourhood satisfaction, street life and work place satisfaction. Street life correlates with social interaction and variety of facilities. This can be explained by the shopping facilities nearby which attract more people in turn which helps contact in the community which in favour of face to face contact.

In Ottawa home satisfaction did not correlate with work place satisfaction and social interaction. One can conclude that Ottawa is characterised by sprawl, with wide and straight streets created for rapid transportation by motor car, which creates unsustainable situations. Spaces are unattractive because they are undefined areas. Spaces are more attractive if the amenities are concentrated in a defined area. Attractiveness of a space is a condition of the existence of generators of activities and that these activities occur in an inviting and favourable space.

Home location and work place satisfaction did not correlated in Ottawa. This reflects the distance that commuters have to commute every day to work. The previous analysis (Chapter 6) shows the desire of the respondent in Ottawa to reselect their home proximity to the work place. Proximity to work will reduce the need to use the car for transport and will make a more sustainable and ecologically friendly urban environment.

It emerge from the Correlation Analysis the importance of the satisfaction of people and their work place, the author believes for a more sustainable urban systems the proximity to the work place should be considered. In summary close home work were the more satisfied people became with their home, jobs and city environment.

FACTOR ANALYSIS

7.8-Introduction

Factor Analysis consists of a number of statistical techniques, which are aimed at simplifying complex sets of data. It starts by drawing a set of inter-correlations between sets of data. By examining all inter-correlations, it therefore forms new groupings of variables, which are relatively independent of each other. The new groups are called factors and represent the main source of variation in the initial data set. Identifying the new factors is a computational process. Interpreting the new factors can be complex, as a generic term is sought to cover the questions from the questionnaire within each new factor.

It was therefore found important to conduct Factor Analysis across 55 subjects from Edinburgh and 37 from Ottawa using variables chosen from the questionnaire. As described above, the intention was to simplify the set of variables and group them in order to form factors. Furthermore, it was intended to discover intercorrelation and patterns between questions, which would reflect the set of variables.

7.9-Factor Analysis related to Edinburgh: Interpretation of Factor Analysis

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.610	36.721	36.721	6.610	36.721	36.721	3.897	21.650	21.650
2	2.747	15.262	51.984	2.747	15.262	51.984	3.574	19.856	41.507
3	1.987	11.039	63.023	1.987	11.039	63.023	2.652	14.733	56.239
4	1.131	6.286	69.309	1.131	6.286	69.309	1.838	10.209	66.448
5	1.054	5.857	75.166	1.054	5.857	75.166	1.569	8.718	75.166
6	.874	4.857	80.023						
7	.851	4.728	84.750						
8	.659	3.664	88.414						
9	.539	2.997	91.411						
10	.378	2.102	93.513						
11	.290	1.609	95.121						
12	.231	1.283	96.404						
13	.208	1.154	97.559						
14	.180	.999	98.558						
15	.126	.700	99.258						
16	5.431E-02	.302	99.559						
17	4.766E-02	.265	99.824						
18	3.165E-02	.176	100.000						

Extraction Method: Principal Component Analysis.

Table 7.4 Factor Analysis of Edinburgh

	Component				
	1	2	3	4	5
Home satisfaction	.788				
Home location	.608			.552	
Overall appearance	.741				
Material	.750				
Spaciousness	.703				
Neighbourhood satisfaction	.830				
Street life	.691				
Variety of uses	.766				
Social interaction	.619				
Work place satisfaction		.527	.564 .510		
Work place location		.791			-.619
Salary satisfaction		.657			
Job satisfaction					
Energy use					

5 components extracted

Component Matrix (Edinburgh)

Rotated Component Matrix

	Component				
	1	2	3	4	5
Home satisfaction	.690				
Home location				.802	
Overall appearance		.736			
Material		.738			
Spaciousness	.726				
Neighbourhood satisfaction	.855				
Street life		.749			
Variety of uses		.640			
Social interaction		.814			
Work place satisfaction			.556		
Work place location			.860		.921
Salary satisfaction			.667		
Job satisfaction		.523			
Energy use					

Table 7.5 Rotated matrix for Edinburgh

The **Table 7.4** illustrates five structures together with their factor loading, which in turn identify the variables that may represent each factor. They are listed in order of importance in a descending manner from Factor 1 to Factor 5. The following shall briefly attempt to explore each factor.

All subjects in Edinburgh evaluated their home and their neighbourhood differently. Data are factor analysed with varimax rotation to:

1) Confirm the underlying variables used to evaluate home satisfaction and neighbourhood satisfaction.
2) Relate the variables to each other. The **Table 7.5** is a matrice structure to all the respondents. The result in a 5-factor solution with eigenvalue greater than 1 was derived accounting for 70% of the variance. The factors extracted are: **Factor 1** Home satisfaction with 36.7% of the variance; **Factor 2** House location with 15.2% of the

variance; **Factor 3** overall appearance with 11.0% of the variance; **Factor 4** building material with 6.2% of the variance **Factor 5** spaciousness with 5.8% of the variance.

7.9.1-Rotated factor matrix

The next step is to look at the information under the heading "rotated factor matrix"**(see table 7.5)**. It is where we will find which variables been loaded onto which factors. A variable is considered to have an acceptable loading if it loads > 0.7 onto a factor.

To apply this interpretation to the output above, we can conclude the following:

Factor 1: Home Satisfaction in Edinburgh is a combination of two factors: spaciousness (factor loading = 0.726) and overall neighbourhood satisfaction (factor loading = 0.854).

Factor 2: House Location is a combination of four factors: overall appearance (factor loading = 0.736), building material (factor loading = 0.738), street life (factor loading = 0.749) and social interaction (factor loading = 0.814).

Factor 3: Overall Appearance is a combination of salary satisfaction (factor loading = 0.860) and satisfaction about variety of uses (factor loading = 0.749).

Factor 4: Building Material is related to house location (factor loading = 0.802)

Factor 5: Spaciousness is related to work place (factor loading = 0.921)

Home satisfaction

Home satisfaction represents the dominant factor extracted, which indicates that the major factor of satisfaction of the home is both a physical and a cultural concept. Home is a place which one loves and which can serve as a retreat from the more public world and from work. It is also a place that can provide an opportunity for restoration, energy and

regeneration. The factor loading (for the samples in Edinburgh) above has shown that the **Home satisfaction factor** is mainly related to two variables: overall neighbourhood satisfaction and spaciousness. Overall neighbourhood satisfaction could be interpreted as satisfaction with shops, location of the house, people and amenities, as mentioned in Chapter 5. People represent the social dimension which is concerned with the interaction between people and individuals. Social interaction manifests itself in many forms, from the obvious gathering of people in clubs or pubs. Shops mainly performed in commercial streets where one moves from one shop to another looking at what one wants or in a closed space such as a shopping centre or a mall. Factors such as variety and activity are among the qualities that shopping centres have, because they are only used by pedestrians. This allows people to move freely from one shop to another without taking into consideration the danger they might be subjected to from vehicles.

House location

House location represents the second factor. People are satisfied about the location of their houses it is close to major facilities. The factor loading above has shown a combination of two variables: street life and social interaction.

The social factor is one of the aspects which deeply affects neighbourhood satisfaction in Edinburgh.

7.10-Conclusion

Factor analysis for the sample of Edinburgh has shown a tendency among residents to be social regarding the choice of residential environment, in order to engage in social contacts and interaction. Social variables have correlated with spatial variables which contribute to

social goals of sustainability. In people's perception in Edinburgh Factor 1 which represents home satisfaction in Edinburgh is a combination of two factors: spaciousness and overall neighbourhood satisfaction. Factor 2 represents house location which is a combination of four factors: overall appearance, building material, street life and social interaction. Factor 3, Overall Appearance, is a combination of salary satisfaction and satisfaction about variety of uses.

7.11-Finding of Factor Analysis Related to Ottawa

Interpretation of factor analysis

Figure 8.14 Down town Ottawa from the bay mall (The author 00).

Table 7.4 illustrates a four-factor structure together with their factor loading, which in turn identify the variables that may represent each factor. They are listed in order of importance in a descending manner from Factor 1 to Factor 4. The following briefly attempts to explore each factor.

All subjects in Ottawa evaluated their home, their neighbourhood and their work place location differently. Data are factor analysed with varimax rotation to confirm the underlying variables used to evaluate home satisfaction and neighbourhood satisfaction. The table below is a matrice structure to all the respondents. The result in a 5 factors solution with eigenvalue greater than 1 was derived accounting for 70% of the variance.

The factors extracted are: **Factor 1** Home satisfaction with 43.8% of the variance, **Factor 2** House location with 13.8 % of the variance, **Factor 3** overall appearance with 11.1% of the variance and **Factor 4** building material with 7.1% of the variance.

7.12-Factor Analysis: The Case of Ottawa

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.898	43.876	43.876	7.898	43.876	43.876	6.617	36.762	36.762
2	2.487	13.818	57.694	2.487	13.818	57.694	2.890	16.054	52.816
3	2.010	11.165	68.859	2.010	11.165	68.859	2.639	14.663	67.480
4	1.288	7.156	76.015	1.288	7.156	76.015	1.536	8.536	76.015
5	.914	5.075	81.090						
6	.797	4.431	85.521						
7	.711	3.951	89.472						
8	.636	3.533	93.005						
9	.450	2.498	95.503						
10	.253	1.404	96.907						
11	.225	1.250	98.157						
12	.146	.813	98.971						
13	9.064E-02	.504	99.474						
14	4.443E-02	.247	99.721						
15	3.819E-02	.212	99.933						
16	8.848E-03	4.916E-02	99.983						
17	3.126E-03	1.736E-02	100.000						
18	5.558E-17	3.088E-16	100.000						

Extraction Method: Principal Component Analysis.

Table 7.6 Factor Analysis for Ottawa

	Component			
	1	2	3	4
Home satisfaction	.729			
Home location	.821			
Overall appearance	.840			
Material	.843			
Spaciousness	.657			
Neighbourhood satisfaction	.829			
Street life	.687			
Variety of uses			-.692	
Social interaction	.602		-.647	
Work place satisfaction				.580
Work place location	.760			
Salary satisfaction				.530
Job satisfaction		.556		
Energy use				

4 components extracted

Component Matrix (Ottawa)

Rotated Component Matrix

	Component			
	1	2	3	4
Home satisfaction	.715			-.542
Home location	.868			
Overall appearance	.900			
Material	.643		.652	
Spaciousness	.614			
Neighbourhood satisfaction	.922			
Privacy	.815			
Street life	.747			
Variety of uses			.858	
Social interaction			.828	
Work place satisfaction				.767
Work place location	.554			
Salary satisfaction		-.547		.506
Job satisfaction		.671		
Energy use				

Component Matrix (Ottawa)

Table 7.7 Factor matrix for Ottawa

7.12.1-Rotated factor matrix

The next step is to look at the information under the heading "rotated factor matrix", where it find which variables have loaded onto which factors. A variable is considered to have an acceptable loading if it loads > 0.7 onto a factor.

To apply this interpretation to the output above, we can conclude the following:

Factor 1: Home Satisfaction is a combination of location (factor loading = 0.868), overall appearance (factor loading = 0.900), neighbourhood satisfaction (factor loading = 0.922), privacy (factor loading = 0.815) and street life (factor loading = 0.747).

Factor 2: House Location is related to variety of uses (factor loading = 0.804).

Factor 3: Overall Appearance is a combination of social interaction (factor loading = 0.828) and satisfaction about variety of uses (factor loading = 0.858).

Factor 4: Building Material is related to work place satisfaction (factor loading = 0.767).

Home satisfaction

The factor loading (for the sample of Ottawa) above has shown that the factor is mainly related to the following variables: overall neighbourhood satisfaction, privacy and street life. Overall neighbourhood satisfaction can be interpreted as satisfaction with shops, location of the house and amenities. Factors such as variety and activity are among the qualities that shopping centres have (for example Billing Bridge Mall), because they are only used by pedestrians, which allows people to move freely from one shop to another without taking into consideration the danger they might be subjected to from vehicles.

Convenience is one of the factors that makes people prefer one place rather to another to do their shopping. Convenience comes from the provision of necessities such as parking places, transport and amenities like restaurants and cafes.

House location

In Ottawa satisfaction with house location is mainly related to variety of facilities. Amenities are features or facilities of a place that make life there easy or pleasant. In Ottawa shopping is one of the essential activities which defines amenities in the city. Shopping is mainly done in malls which are accessed by cars or buses.

7.13-Interpretation of Factor Analysis

Edinburgh	Ottawa
Factor 1: Home Satisfaction: Factors spaciousness and overall neighbourhood satisfaction.	**Factor 1: Home Satisfaction:** of location overall appearance, neighbourhood satisfaction, privacy and street life.
Factor 2: House Location: overall appearance, building material, street life and social interaction.	**Factor 2: House Location** is related to variety of uses.
Factor 3: Overall Appearance: salary satisfaction and satisfaction about variety of uses.	**Factor 3: Overall Appearance** is a combination of social interaction and satisfaction about variety of uses.
Factor 4: Building Material is related to house location.	**Factor 4: Building Material** Related to work place
Factor 5: Spaciousness Related to work place	

Table 7.8 Comparison between factors

Social factors

The social factor is one of the most significant aspects which deeply affects neighbourhood satisfaction in Edinburgh.

The analysis and explanation of human behaviour in the environment without reference to social organisation in all its aspects would be a task doomed to failure (Leboyer 1973).

In the same way, only a very impoverished picture of social behaviour would be obtained if it were to be forgotten that this involves the use of space.

The city expresses social values. Closely related but distinct is the expression of the social significance of place. As Ittelson (1978) puts it: "the city, like any environment, has the potential of enhancing value systems".

Human societies consist of specific traits, which set up the complex pattern of relationships in which people encounter one another, transmit information and simply coexist. These patterns exist within spatial contexts, and some built environments encourage this behaviour. The development of this spatial network is tied into the social network. Neither one is the cause of the other, but they are an intrinsic part of each other. As a result social traits are frequently visible in spatial elements; one such example is a market square, a space which locates the weekly open market or perhaps the market arose to fill the square. Both facets are an intrinsic part of the other's existence. The visibility of social traits in the physical environment allows cultural identities to be visible.

7.14-Descriptive Analysis

A descriptive analysis is one of the techniques used in research to describe the variables. Standard deviation is one kind of descriptive analysis, which describes the distribution or the spread of responses of the respondents for particular variables. In this part of this research Standard Deviation. (SD) was used to describe the distribution of ratings taken for respondent.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
salary satisfaction	42	3.1190	1.2917	.1993
job satisfaction	42	2.8810	1.3651	.2106
work place location	51	3.4706	1.2861	.1801
work place satisfaction	49	2.3469	.9906	.1415
satisfaction about variety of uses	44	3.1591	1.7110	.2579
energy use on transport	37	3.0270	1.1663	.1917
HOMESATI	55	2.0545	.7798	.1051
HOUSELOC	55	1.8182	1.0200	.1375
HOUSORIE	51	2.1961	.9385	.1314
HOUSVIEW	53	2.2830	1.2307	.1690
OVERAPP	53	2.3774	.9035	.1241
BUILDMAT	53	2.5094	1.2029	.1652
SPACIOUS	55	2.5091	1.2747	.1719
NEIGHSAT	55	2.0182	.9524	.1284
SECURITY	55	2.0909	.9675	.1305
STRETLIF	55	2.4000	1.1801	.1591
PRIVACY	55	2.1636	1.0321	.1392
VARUSES	48	2.2083	1.0711	.1546
SOCINTER	53	2.8302	1.1391	.1565
NEISATIS	47	2.0851	.8030	.1171
SATISSUS	40	2.7000	1.4178	.2242

Table 7.9 Mean and Standard Deviation (SD) for the Edinburgh setting

7.14.1-Findings of descriptive analysis

In general the results show that the SD for the setting of Edinburgh in term of locational choice, social aspects as well as the preference for the work place being closer to the living place is much higher than in Ottawa. The table above shows the Mean and SD of differents variables that have been tested.

	N	Mean	Std.	Std. Error Mean
JOB SATISFA	37	2.2973	1.1271	.1853
SATISSU	36	2.8056	1.1667	.1944
ENERGY USE TRANS SATISF USES	37	2.1892	.8445	.1388
WORK PLACE SATIS	36	2.3333	.8619	.1436
SALARY SATISF	36	3.3333	.9856	.1643
HOMESAT	37	2.0000	.9428	.1550
HOUSELO	35	1.6857	.7581	.1282
OVERAP	32	2.5938	1.1319	.2001
BUILDMA	35	2.6571	1.0556	.1784
NEIGHSA	37	1.8108	1.0498	.1726
STRETLI	37	1.9730	1.3226	.2174
PRIVACY	37	2.0811	1.2106	.1990
VARUSES	37	2.6216	1.3815	.2271
SOCINTE	37	3.0270	1.3434	.2209
NEISATI	37	2.1351	1.1096	.1824

Table 7.10 Mean and Standard deviation(SD) for the setting of Ottawa

7.14.2-Interpretation of the descriptive analysis

The Mean for rating locational aspect, work place location neighbourhood satisfaction and home satisfaction was higher in Edinburgh than in Ottawa. The distribution of ratings for the variables home satisfaction, variety of uses and street life in the case of Edinburgh was relatively higher than other variables in Ottawa.

A general observation is that interviewees in Edinburgh were mainly satisfied with the location of their house neighbourhood and work place location. Results show that the SD and Mean in Edinburgh is higher than the SD and Mean of Ottawa. This could reflect the fact that close proximity between activities, working place and living place were the main reasons for satisfaction in Edinburgh.

In contrast urban sprawl such as found in Ottawa consequently makes people travel longer distances and spend more time in commuting. This becomes a main contributor to dissatisfaction in terms of location of work place and housing.

7.15-Conclusion

The findings indicate conclusively that the interviewees in Edinburgh were satisfied with the distance of travel to their work place, as in this case commuting distance correlates with commuting time. Major activities are located close to each other and daily shopping is mainly done on foot. On the contrary, in Ottawa activities are segregated and a longer travel distance is needed for daily shopping which is mainly done by car.

Social parameters correlate closely with spatial factors in the case of Edinburgh, where correlation analysis shows a high correlative value. Satisfaction with home correlates with street life, and neighbourhood satisfaction correlates with social interaction. On the contrary in Ottawa home location correlates more closely with salary satisfaction. The desire to reselect the work place closer to the living place was dominant in both cities.

The next chapter introduces the open-ended questionnaire (qualitative analysis). The open-ended questionnaire was distributed separately from the questionnaire. Its intention was to elicit people's perception in a way that the researcher could later structure into categories and activities.

Chapter 8

Open-ended Questionnaire Analysis

CHAPTER 8
OPEN-ENDED QUESTIONNAIRE ANALYSIS

8.1-Introduction

The objective of this section is to identify aspects of sustainability through exploring people's responses, using an open-ended questionnaire. An Open-ended questionnaire was distributed separately from the questionnaire on people of Edinburgh the purpose was to minimise any influence that might be imposed upon the respondents by the questions and to what extend people's perception are grouped in categories.

In this Chapter, the author explores people's interpretations of their built environment, taking into consideration the contextual dimension. This means trying to understand people's preference system as a phenomenon that is associated with their own environment.

8.2-Open-ended Questionnaire

Qualitative research is a tradition particular to social science that depends on observing people in their own territory. The methodology is used in many disciplines for example the social sciences, and in such fields as education and public health.

In his book which deals with a better understanding of social phenomena through 'grounded theory', a particular style of analysis, Strauss says:

> "*Qualitative methodology can be applied in different disciplines such as social science, education, and public health*" (Strauss A, 1987: 1).

Qualitative methods of qualitative research may take different dimensions: (Silverman, 1993) observation, interviewing, transcripts and data. All these dimensions deal with how we can interpret materials and data and do it effectively and efficiently.

There is no standard approach among qualitative researchers. For instance, Marshall and Rossman list six different qualitative research traditions, including ethnography, cognitive anthropology and symbolic interactionism. These all share a commitment to naturally occurring data: "*Each assumes that systematic inquiry must occur in a natural setting rather than an artificially constrained one such as an experiment*" (in Silverman D, 1993: 23). However, they recognise a wide variation between approaches depending on how intrusive the researcher is required to be in the gathering of data, whether these data document verbal or non-verbal behaviour or both, whether they are is appropriate to question the participant as to how they view their worlds, and how data can be fruitfully analysed.

Burgess uses a model drawn from just one of these approaches, social anthropology. He wrote:

> "*It would appear that field research involves observing and analysing real-life situations, of studying actions and activities as they occur. The field researcher, therefore, relies upon learning first and about a people and culture*" (quoted in Silverman D, 1993: 23).

More recently, Bryman (quoted in Silverman D, 1993: 24) attempts to characterise qualitative research according to six criteria. These criteria are:

1) Seeing though the eyes or taking the subject's perspective.

2) Describing the mundane detail of everyday settings;

3) Understanding actions and meanings in their social context;

4) Emphasising times and process;

5) Favouring open and relatively unstructured research designs;

6) Avoiding concepts and theories at an early stage.

Number 1) involves 'a subjective' perspective which derives from anthropology, while Number 5) and Number 6) are out of tune with the greater sophistication of contemporary field research design, born out accumulated knowledge of interaction and greater concern with issues of validity and reliability.

A second version of qualitative research by Hammersley (1990) (Silverman D, 1993: 25) suggests the following:

1) The use of everyday contexts rather than experimental conditions;

2) A range of sources of data collection;

3) A preference for 'unstructured' data collection (no hypotheses, no prior definition);

4) A concern with the 'micro' features of social life (single setting or group);

5) A concern with the meaning and function of social action;

6) The assumption that quantification plays a subordinate role.

A third version of qualitative research by Hammersley (1992) (Silverman D, 1993: 26) states:

1) A preference for qualitative data - use of words rather than numbers;

2) A preference for naturally occurring data observation rather than experiment, and unstructured interviews;

3) A preference for meanings rather than behaviour - attempting 'to document the world from the point of view of the people studied';

4) A rejection of natural science as a model;

5) A preference for inductive, hypothesis generating research rather than hypothesis testing.

There are four major methods used by qualitative researchers. These methods are often combined. For instance, many case studies combine observation with interviewing. **Table 8.1** below shows that the methods are associated techniques which take on a specific meaning according to the methodology in which they are used. Silverman (1993) lists the following methods.

Method	Quantitative Research	Qualitative research
Observation	Preliminary work, e.g. prior to framing questionnaire	Fundamental to understanding another culture
Textual Analysis	Content analysis, i.e. counting in terms of research categories	Understanding participant categories
Interviews	'Survey research 'mainly fixed-choice questions to random samples	'Open-ended' questions to small samples
Transcripts	Used infrequently to check the accuracy of interview records	Used to understand how participants organise their talk

Table 8.1 Techniques of Research Methodology (Based on: Silverman D 1993: 9)

Simon (1969) argues that the participant-observation strategy is to immerse oneself in all aspects of the situation by using all available sources of information: informal talks with members of the group one is studying, reading letters and other documents, passively observing and listening while simply 'hanging around' with the group and so on. The key difference from other research methods is that the observer participates with and has some

sort acknowledged role in the group, rather than maintaining a distance. Carolyn Baker states:

> "*When we talk about the world we live in, we engage in the activity of giving it a particular character. Inevitably, we assign features and phenomena to it and make it out in particular way. When we talk with someone else about the world, we take into account the person could be presumed to know, 'where that other is in relation to ourselves in the world*" (Silverman D, 1993: 90).

Here Baker is questioning the attempt to treat interview question and answer as a passive filter towards some truths about people. Instead, she is telling us that interviewer and interviewee actively construct some version of the world appropriate to what we take to be self-evident about the person to whom we are speaking and the context of the question.

According to 'interactivism', interviewees are viewed as experiencing subjects who actively construct their social world; the primary issue is to generate data which gives an authentic insight into people's experience; the main ways to achieve this are open-ended interviews usually based upon prior, in depth, participant observation. Silverman (1993) says:

> "*Authenticity rather than reliability is after the issue in qualitative research. The aim is usually to gather an 'authentic' understanding of people's experience, and it is believed that 'open-ended' questions are the most effective route towards this end*" (Silverman D, 1993:10).

Proshansky refers to: "cognition about the physical world in which the individual lives." He adds:

> *"These cognitions are memories, ideas, feeling, attitudes, values, preferences, meanings, and conceptions of behaviour and experience, which relate to the variety*

and complexity of physical setting that defines the day-to-day existence of every human being. At the core of such physical environment related cognition is the environmental past of the person; a past consisting of places, spaces, and their satisfaction of the person's biological, psychological, social, and cultural needs"

(Silverman D, 1993:10).

8.3-The Research

An open-ended questionnaire was distributed randomly in Edinburgh. To achieve the combination between a quantitative and qualitative described above. The questionnaire was divided into different parts which explored different aspects involved in experiencing the city of Edinburgh, in order to elicit the feelings towards people's interpretation of the built environment. It was intended that these questions evoked responses about personal needs, hopes, social tendencies and other characteristics that are important in people's image of their own urban environment.

8.4- Analysis

In this part the analysis is carried out in this part for each question.

Question 1:
Mention two things which you like in your house

	Frequencies
Kitchen	10
Living room	6
Space	5
Bedroom	5
Area and neighbourhood	4
Location	4
Windows	4
Materials	3
Garden	3
Views	3
Heating system	2
Architecture	1
Hall	1
Price	1
Storage	1

Table 8.2 The most important things liked in the house

Question 1 shows that the most important things preferred in the house according to the respondents were the kitchen, the living room, space, the area and the neighbourhood.

Table 8.3 shows results of reasons for their satisfaction with the house. The most important are: size (space) which implies comfort and convenience, then proximity to the city centre, which is mainly concerned with the location of the house in relation to amenities (see Chapter 6).

Other reasons for satisfaction were that it was in a quiet area, near woods, was large, comfortable, relaxing and convenient (see **Table 8.3**)

Reasons	Frequencies
Spacious (size)	8
Near city centre	4
Views	3
Nature	1
Relaxing, convenient	1
Comfortable	1
Materials	1

Table 8.3 Things liked in the house

Question 2:
Mention two things you do not like in your house?

Question 2 shows that the most important things not preferred in the house according to the respondents were materials, the location and lack of space.

	Frequencies
Materials	6
Kitchen	5
Bedroom	3
Location	3
Spaciousness	3
Neighbours	2

Table 8.4 Things disliked in the house

Table 8.5 shows piling results of reasons for dissatisfaction in the house (similar reasons of dissatisfaction could be found in **Table 8.7**). The most important reason mentioned by the respondents were: lack of space, closeness to the city centre, noise, too small or walls too thin, weak walls (unsafe), expensive or being away from the centre.

Materials

Materials are the main reasons disliked in the house. Materials could contribute to sustainability, the use of appropriate materials to save energy (see Chapter 6 section 6.12).

Reasons	Frequencies
Space	8
Location	3
Security	1

Table 8.5 Things mentioned as reasons for dissatisfaction in the house

Space

Space was mentioned as the main reason for dissatisfaction in the house. Lack of space makes people uncomfortable in their environment. The small space was also mentioned as a reason for dissatisfaction see Table 8.7. Space is important to sustainability, providing larger space means more materials is needed for construction and more energy for heating which has an impact on cost.

Location

Location is the second main thing mentioned as a reason for dissatisfaction in the house. It is important to understand it under the context of sustainability. The location of the house next to amenities contributes in a way to reducing distance and time therefore to saving energy and resources.

Security

Security was also mentioned as a reason for dissatisfaction in the house. Security allows people to enjoy life in a place, whether this feeling is related to job security, financial security or safety. This dimension is very important for sustaining the urban systems.

Things mentioned	Reason for satisfaction	Things mentioned	Reason for satisfaction
1-Area and neighbourhood	-Quiet, shops	8-Materials	-Wooden floor (looks good), thick walls (sound proof), stone walls (long lasting)
2-Location	-Near woods and city centre -Near town, near college and university	9-Windows	- Bright, lightness, bay windows (extra light)
3-Views	-External landscape (green and clean), sea, on the harbour, nature	10-Heating system	-Gas central heating (low cost)
4-Living room & Dining room	-Large, well designed, comfortable, fire place, spacious -Large, size, spacious, very roomy	11- Georgian architecture	-Nice
5-Bedroom	-Nice views	12- Hall	-Welcoming
6-Kitchen	-Right size, good size -Big, large -Sunny -Like cooking	13- Spaces	-Relaxing, convenient.
7-Garden	Big, nice, barbecue		

Table 8.6 Things liked in the house

Things mentioned	Reasons	Things mentioned	Reasons
1-Area and neighbourhood	-Noise	7- Washroom	-Too small
2-Location	-Distance from the centre	8-Materials	-Walls too thin, wall paper (colour) -Weak walls (unsafe), wood -Water pipe line (noisy)
3-Cost	-Expensive	9-Windows	-To small, cold in winter -Light not enough - Pollution
4-Living room and Dining room	-No dining rooms	10-Heating system	-Insufficient, no central heating
5-Bedroom	-Too small	11-Spaciousness	-Not enough room
6-Kitchen	-Too old, too small, no windows -Cheap surfaces difficult to clean -No natural ventilation	12-Neighbours	-Strange, aggressive, noisy

Table 8.7 Things disliked in the house

Question 3:

Can you mention what you like in your neighbourhood as a place to live?

	Frequencies
Shops	8
Location	6
Park	5
View	2
People	2
Sense of community	2
Nature	1
Cheap	1
Safety	1
Good local amenities	1

Table 8.8 Things liked in the neighbourhood

Question 3 shows that the most important things preferred in the neighbourhood according to the respondents were shops, the location of the neighbourhood and park **(see Table 8.8)**.

Shops

Shops provide goods for people. Providing mixed uses are considered important by advocates of sustainability. Shops increase contact between people; they allow communication and interaction to flourish. Interactions with a large number and variety of people and groups is at the core of the concept of communities, as, organisations with sustained interpersonal relationships, because it not only fulfils the need for affiliation and belonging but offers an opportunity for a wide range of human behaviour.

Parks

Natural environment

Parks is the third main reason giving for liking in the neighbourhood. Many writers argue that the natural environment in cities can still play a major role in moderating the impacts of human activities, for example the role of plants in absorbing pollutants and releasing

oxygen. Most environmentalists advocate the use of natural spaces within urban areas. Not only do parklands play their own valuable role in providing safe play space for children and adults they can also develop their own aesthetic appeal. However some urban designers express concern over the value of large parks in particular, as they tend to break up the connectivity between different urban functions and therefore increase car usage (Haughton 1994).

Sherlock advocates that, in addition to providing at least one park in every district of the city, greening the city should be achieved with measures to spread greenery throughout the cities, with trees and shrubs on pavements and the use of plots in front of, behind and between buildings. Tree planting can be important in filtering local air pollution, providing a noise barrier, providing visual screening and enhancing neighbourhood identity where planted in large numbers in close proximity, trees may help reduce carbon dioxide pollution (Haughton 1994: 119).

Question 4:
What do you dislike about your neighbourhood as a place to live?

	Frequencies
Location	3
Traffic	3
Street	2
Social life	2
Shops	1
Noisy neighbours	1
Car park	1

Table 8.9 Things disliked in the neighbourhood

The question shows the most important things mentioned by respondents. Location is mainly attributed to the distance from the centre, the traffic by the noise, and shops by a lack of such conveniences.

Traffic

Traffic represents (equal to location) a main thing disliked in the neighbourhood. Excessive car use and traffic congestion are very closely related. As argued in Chapter 1 advocates of sustainable urban environments encourage the reduction of car use on account of its a negative impact on cities such as traffic pollution and noise. High road traffic levels can also have major impacts on the level of social interaction and community cohesion. Increased road traffic is directly related to alienation. In a classic study Appleyard (1981) found many more instances of local acquaintances and friends in those streets with lighter traffic, where people had more chances of meeting, as people sat on the porch or in gardens, and as children played in the street. In a similar vein, a large road through a neighbourhood can effectively cut it in two, limiting access to friends and services. For young children, too, the impacts of increasing numbers not being allowed to walk to school unattended, in large part prompted by fears of traffic accidents, reduce the autonomy of children and imposing burdens on parents and minders.

Traffic calming

Many local authorities have attempted to minimise the intrusion of road traffic by prohibiting access to heavy goods vehicles, using traffic calming measures, providing cycle ways and bus lanes, constructing noise baffles, pedestrianising certain streets and declaring others as play streets, providing parking permits for residents only, building safer pedestrian routes and developing green links between pedestrian routes and public transport. Traffic calming in particular involves a major redesign of streets, narrowing entrances to roads, building chicanes, imposing lower speed limits, road humps and introducing benches, trees and so on, to encourage greater pedestrian use. Such initiatives can contribute to both social and environmental sustainability. A study of controls in 65

residential zones showed that they led on average to traffic accidents falling by 9% (OECD 1993).

Question 5:
Identify two things you wish to change about your neighbourhood

	Frequencies
Location	2
Security	2
Cleaner streets	2
Less traffic	2
Social life	1
Car use	1
Recycling materials	1
Public transport	1
Landscape	1

Table 8.10 Things to change in the neighbourhood

Question 5 shows that the things which the respondents most wish to change in their neighbourhood. The most important by order of choice were the location, security, cleaner streets and less traffic.

Location

Location was frequently mentioned as a main thing that people want to change in the neighbourhood.

Security

Security contributes to sustainable urban environment. People want to feel safe and secured within their own environment, homes. A man's house has often been described as his 'castle', a symbol of strength and fortress. A person will feel secured if he or she can control his own security within the limitations of reality and human potential. Urban areas are planned for masses of people and for fast-moving machines. In this situation often the

individual will find it difficult to feel secured or in control of his or her environment. Safety and security also extend to the avoidance of pollution, noise, accidents and traffic safety.

Less Traffic

Reducing traffic represents the fourth main thing people want to change in the neighbourhood. Excessive car use and traffic congestion are very close. Advocates of sustainable urban environment encourage the reduction of car use which has a negative impact on our cities such as traffic pollution and noise (as it has been explained in the previous sections).

Recycling materials

Recycling materials was also mentioned (see table 8.10) by people as a thing to change in the neighbourhood (see Chapter 6 section 6.13).

Question 6:
What do you like about your place of work?

	Frequencies
Near/ proximity/ close	16
Transport	5
People friendly	3
Wage	1
View	1

Table 8.11 Things preferred in the place of work

Question 10 shows that the most important thing attributed to the place of work according to the respondents was its proximity to home. The most important reason mentioned by the respondents for this is that the commuting distance to work represent a major problem for many people.

Proximity

Proximity is important for sustaining the urban systems. Being close to amenities such as shops and schools means people need to travel less by car and commute less to their place of work. This has an impact on energy use as well as on travel distance. Proximity will decrease the need for automobile transport and therefore not only decrease gaseous emissions but also the need for road construction. It also creates urban vitality and social cohesion in addition increasing availability of time for social activities and interaction, as discussed in Chapter 1.

Question 7:

What do you dislike about your place of work?

	Frequencies
Distance	5
Isolation	2
Noise	1
Wages	1

Table 8.12 Things not preferred in the work place

Question 11 shows that the most disliked aspect of the place of work according to the respondents as distance followed by isolation, noise and wages.

Distance

The most important thing disliked about the work place is distance. Longer distance between residential areas and work place means an increase of use of car which has more impact on our environment in term of traffic, noise and pollution. For a more sustainable urban system is to reduce the travel distance between home and work place (see Chapter 6).

Wage

Wage was also mentioned as a reason disliked in the work place. Wage contributes to sustainability and to economic goal (see Chapter 1 section 1.7.3). Providing reasonable earning could help to maintain people in their place.

8.5-Interpretation of Results: Categories and Dimensions

The information relating to people's interpretation of the city is not very manageable in its raw state and therefore a method of abstraction or classification is required.

At its simplest the frequency of any one response turning up can be a gauge of its importance. Two ways of classification have been utilised based on the Ujam Model (see F.Witworth, 1992) one of which is 'dimensions', which is looked later. The other kind of classification is 'category', which divides the responses into three categories: objects, adjectives or aspects, and activities. These divisions relate to the meanings of the words, as seen by the respondents. The three categories simplistically cover the whole environment of *stimuli*, *interpretation* and *reactions*.

The *stimulus* is the object, i.e. a building, a street or an area. The *interpretation* is what the observer feels on encountering the object, and this is expressed using an adjective such as calm, old, clean, or noisy. Finally the observer will *react* to this interpretation of the stimulus perhaps by walking away, stopping and staring, sitting down or buying something. In this way all aspects of our environment are included. The inter-relationship between different elements of categories gives an overall deep understanding of people's interpretation of the built environment.

The responses resulting from the open-ended questionnaire have been classified into three categories **(see Table 8.13)**.

Objects	Freq	Adjectives	Freq	Activities	Freq
Location/ City centre	34	Spacious	19	Social interaction	14
Shops	16	Social	5	Shopping	11
Bedroom	13	Amenities	1	Viewing	6
Kitchen	10	Natural	1	Meeting people	1
Materials	10	Economic	1	Visiting friends	1
Windows	6	Secure/ Safe	1		
Parks	6	Quiet	1		
Living room	6	Clean	1		
Area and neighbourhood	4	Nice	1		
Garden	4	Look good	1		
The market	3	Noisy	1		
Heating system	2	Expensive	1		
Street	1	Small	1		
Meeting places	1	Old	1		
Library	1	Cheap	1		
School	1	Aggressive	1		
University	1	Strange	1		
Parking places	1	Insufficient	1		
		Cold	1		
		Dirty	1		
		Communication	1		
		Comfortable	1		
		Clean	1		
		Good living	1		
		Good atmosphere	1		
		Knowing each other	1		
		Healthy	1		
		Isolated	1		
Frequency	**120**		**50**		**33**

Table 8.13 Results classified into categories of objects, aspects and activities

8.6-Objects

Objects are the physical attributes of the environment, and not solely the built features. This is a list of the real aspects of an environment, and hence they are the primary stimulants to all emotion and to all activities. The physical attributes have the greatest likelihood of

linking to the other components of the place in question as these facilitate the identification of places. In houses, these attributes are likely to be those which lead to a distinction between rooms, whereas in the cities they help to identify areas, location, a street. This section looks at the most important objects, as confirmed by respondents.

8.6.1-City centre

City centres, down town and central business district (CBD), all mean the same and refer to high concentration of use, activities and buildings. The city centre is the heart of any city: there you can find anything from commercial to institutional services, as well as cultural or recreational facilities, because the city centre has a good location and transportation links.

Location to the city centre, being easy to reach either by walking or by public transport, is one of the major reasons that makes it active and busy with people who are using it for shopping and commercial purposes.

8.6.2-Location

Location was frequently mentioned as a main reason liked for living in the neighbourhood. It is important to understand it in the context of sustainability.

Lozano (1990) argues that location determines the specific effect of and interrelationships within an urban system acting upon a particular site. He adds that urban distribution is the result of the interaction of people and activities in concentrated urban space, all of them aiming at reducing the cost and time and increasing the advantages of their roles in the urban system. Loosely distributed locations are, reflected in the dispersion of population and employment and the creation of dispersed centres.

8.6.3-Proximity

Proximity decreases the need for automobile transport and therefore not only decreases gaseous emissions but also the need for road construction. It also creates urban vitality and social cohesion in addition to increasing the availability of time for social activities and interactions as discussed in Chapter 1.

8.6.4-Shops

Shops provide amenities and goods for people and increase contact between people as they allow communication and interaction to flourish. Interactions with a large number and variety of people and groups is at the core of the concept of communities as organisations with sustained interpersonal relationships, because it not only offers a way to fulfil the need for affiliation and belonging but offers an opportunity for a wide range of human behaviour. Shopping is becoming strictly functional act of purchasing that involves a simple trip from one's home to a shopping centre. However, urban shopping was once also a social ritual that included window-shopping, promenading, meeting friends informally and exchanging information.

8.7-Aspects

Aspects are among factors that reflect the qualities through people's ideas about their own environment. Aspects consist of the properties perceived in the activities or objects. They are descriptions not so much of the real object but of the observer's image or evaluation of the objects.

8.7.1-Social aspect

The social factor is one of the aspects which most significantly affects the neighbourhood, the community and the planning of the city. The social dimension is concerned with the results of interaction between individuals. Society is said to be structured and, if so, the space it inhabits should reflect this structure. Social interaction manifests itself in many forms, from gatherings of people in clubs, pubs or cinemas to more subtle associations in the street. As mentioned in Chapter 1 social goals of sustainability could be achieved through enhancing social interactions between individuals in the neighbourhood.

Meeting people

Meeting people is one of the activities most enjoyed in people's everyday lives. Meeting people could contribute towards social goals of sustainability. People meet to talk, drink tea and coffee, to play and have fun. Meeting people is one of the society's customs and traditions. Meeting people may happen purposely when you intend to visit someone at home, at work or in celebrations and festivals, and it may happen by chance in a street, at the beach, in the market.

8.7.2-Convenience

Convenience or functional efficiency, has been a determining factor of evaluation. Convenience could be many things; it could be a sufficient amount of daylight or natural ventilation in a building for example; it could be the quality of a place that makes it convenient to use, such as aspects of accessibility and easy circulation; or it could be safety factors, making a place safe and consequently convenient to use.

8.7.3-View

The view could be classified as an object, but the act of observing the view is an activity. The act of viewing entails pausing halfway along the street, looking out of the window or finding a park bench which is facing the right direction. People consider the view as one of the qualities of the place. Topography allows individuals to view scenes from different locations and positions. Viewing may be performed in different ways. It could take place as watching people in the street from ones own window. It could be viewing a panoramic scene of an old city, or viewing the natural landscape spread beyond the city.

Viewing may be related to other activities, such as eating in restaurants that have a good view. Walking or driving are also enriched if these are associated with interesting views.

8.7.4-Active

A city is defined by its outdoor spaces and what happens in them. The place is considered active according to the variety or diversity of the activity that occurs in the street. Street life can develop from basic activities such as shopping, but the particular language, noise level, dress, speed, and density define the special character of each neighbourhood. Bakon (1979) describes street life in New York saying:

> *"Shopping on Saturday afternoon on New York's elegant Madison Avenue is an exhibition of stylish consumption, a display of people clothed like mankind in the boutique window, strolling leisurely down the street, flowing smoothly in and out of the art gallery and the shopping on Sunday on New York's lower east side is a noisy and intense body-to- body mixture of Spanish bargain hunters"*

In the city of Edinburgh the quality of being active is a very important component in people's evaluation.

8.8-Activities

Activities occur in space streets, squares and urban spaces; therefore houses and city prototype are, in fact, a reflection of people's way of life. Urban spaces are places where people can express themselves publicly. They act as a focus for people meeting, for entertainment, for social occasions, and for commercial and information exchanges. Urban spaces then are important as a social environment and as a setting for communication.

Gehl's (1987) studies give an explanation as to how the physical environment affects people's activities. In his opinion, outdoor activities in public spaces can be divided into three categories: *necessary, optional and social.*

Firstly, necessary activities include all activities in which those involved are to a greater or lesser degree required to participate, such as going to school or to work, shopping, waiting for transportation. Because the activities in this group are necessary, and will take place throughout the whole year, they will not be conditioned by the physical framework. They are more or less independent of the exterior environment, without any choices for people to participate.

Secondly, optional activities include those pursuits that are participated in if there is a wish to do so and if time and place make it possible. These activities are controlled by environmental exterior conditions. Optimal conditions of weather and place can invite these

types of activity. This relationship is particularly important in connection with physical planning because most of the recreational activities that are especially pleasant to pursue outdoors are found precisely in this category of activities.

Thirdly, social activities include all the activities which depend on the presence of others in public space, both active and passive. The former are communal activities of various kinds, walking, talking, running and playing. The latter involve simply seeing and hearing other people, watching and being watched. Gehl (1987) describes these activities as 'resultant', because in nearly all instances they evolve from activities linked to other activity categories. They develop in connection with the other activities because people are in the same space, meet, pass by one another, or are merely within view (Gehl, 1987).

Activities and activity systems are an even more specific aspect of life-style which may offer a most useful entry point into relating culture and environment via human behaviour (Rapoport 1977). Starting with activities, it should be possible to work through the sequence and to identify more easily differences in life-style, values, world views and, eventually, culture as they relate to the built environment. Activity systems in space and time have been much used by planners and environmental designers and because they can easily be related to behaviour setting systems (Rapoport 1977).

Activities however, have been overly generalised and cultural differences have been neglected or only their manifest aspects considered. Yet activities, even at the level of so-called basic needs, seem extremely variable (Rapoport, 1969). This variability increases as one moves away from the manifest aspects to what have been called their latent aspects. This variability means that one must deal with specifics, so that, for example, while sitting

is a universal activity, whether one sits on the floor or on chairs has major implications for behaviour, manners, dress, furniture design and room furnishings.

Thus, through considering differences among apparently simple molecular activities such as cooking, eating, playing, sleeping, shopping or even sheltering, we can eventually obtain more molar concepts such as life-style, values and eventually world views and subcultures as they relate to the built environment.

Activities associated with the activity system may include talking, eating, socialising, getting messages to people, and finding out what goes on. Finally, the symbolic meaning may be displayed, such as conspicuous consumption, shopping as recreation, or a way for women to get out of the house.

8.9-Dimensions

Dimensions are the motivating influences or forces behind any occurrence in the environment, whether the occurrence is physical or emotional, visible or invisible, permanent or transitory. These include such as weather, building materials, whereas internal influences include the inherited traits of living or the desire to socialise. Every action, every motion, every building is a result of a number of these underlying needs. Together these forces or dimensions make up what consider to be the culture of a place and as such affect its spatial or architectural properties (Ujam, F. see F.Whitworth, 1992). Dimensions also affect people's interpretation of the built environment. This part of the research identifies the dimensions used by people to evaluate their urban built environment,

and tries to find out if these dimensions are the same for different people and to what extend they contribute to sustaining the urban environment.

There are approximately 113 separate responses which provide the information relating to people's interpretations of the city. A classification process was conducted on all responses to elicit the dimensions. In general, the dimensions may be subjective or objective in interpretation. The author classified the responses into six dimensions. Each dimension has many components or aspects. The spatial dimension contains the dimension of proximity, location and space. The physical dimension contains all physical aspects such as materials, street and amenities. The social dimension is composed of aspects of social interaction and life style. **Table 8.14** shows the dimensions elicited from the respondents responses.

Dimensions	Reasons	Freq
Spatial	Proximity	16
	Location	14
	Space	8
	Total	**38**
Physical	Shops	9
	Materials	6
	Traffic	5
	Distance	5
	Street	4
	Transport	1
	Amenities	1
	Car park	1
	Car use	1
	Total	**33**
Psychological	Safety	8
	Security	3
	Isolation	1
	Welcoming	1
	Comfortable	1
	Convenient	1
	Relaxing	1
	Total	**18**
Natural	Park	5
	View	3
	Nature	1
	Landscape	1
	Total	**10**
Social	Social life	3
	People friendly	3
	Sense of community	2
	Neighbour	1
	Total	**9**
Economical	Wage	2
	Expensive	1
	Noise	1
	Cheap	1
	Total	**5**

Table 8.14 Dimensions

8.9.1-Spatial dimension

The spatial dimension is the most representative of all other dimensions. People's expressed their desire to be in proximity to town and city (this notion is addressed in the coming sections).

8.9.2-Physical dimension

The physical dimension relates to physical aspects such as materials and transport. The physical dimension is the second most representative of all other dimensions which contribute to sustainable urban systems.

8.9.3-Psychological dimension

In their responses, the interviewees expressed their feeling and emotional preferences by using terms such as 'comfortable', 'convenient' feeling' or a 'sense of security and safety' these notions could contribute to sustainability.

8.9.4-Social dimension

The social dimension contributes to sustainability and to social goals and therefore to sustaining the urban systems (see Chapter 1 section 1.7). The analysis and explanation of human behaviour in the environment without reference to social organisation in all its aspects would be a task doomed to failure (Leboyer 1973). In the same way, only a very impoverished picture of social behaviour would be obtained if it were not recognised that this involves the use of space. In fact, direct observation allows us to determine how the arrangement of the environment reflects social organisation. In addition, social behaviour mostly takes place in public spaces where each individual defines and defends his or her own territory. In the factory, the office, recreation areas, business places, in transit and in

school, the space is public and people have to acquire some of it for themselves. They then defend this temporary territory, and in this way constant interpersonal relations and links between people and their space are created.

The city expresses social values. Closely related but distinct is the expression of the social significance of place. As Ittelson (1978) puts it: "*the city, like any environment, has the potential of enhancing value systems*".

Human societies are characterised by specific traits which set up the complex pattern of relationships in which people encounter one another, transmit information and coexist. These patterns exist within spatial contexts, and some built environments will encourage this behaviour. The development of this spatial network is tied into the social network. Neither one is the cause of the other, but they are an intrinsic part of each other. As a result social traits are frequently visible in spatial elements. One such example is a market square, a space which locates the weekly open market or perhaps which the market arose to fill. Both facets are an intrinsic part of the other's existence. The visibility of social traits in the physical environment allows cultural identities to be visible.

8.9.5-Economical dimension

Economy is a major generator or the driving force that influences cities and urban centres. The growth and development of cities and urban centres is mainly related to their ability to develop their economy. Economy also has relationships to people life in terms of their ability to achieve a suitable standard of living (see Chapter 1 section 1.7). Economics can affect our lives in several other ways. Built environments rely on the existence of a local economy to employ their inhabitants and are the vessels in which different activities are

undertaken. Those who inhabit the built environment need to support their activities, whether these activities are directed at earning a living or constitute other social functions.

Cities and urban centres have the ability to grow through their ability to provide more people with the means to earn a living. Urban growth therefore is clearly related to economic growth. The influx of money and wealth attracts more people, thereby creating a growing need for housing and services that are provided for by building. Similarly, a weakness in the local economy will force people to migrate.

8.10-Conclusion

The purpose of the open-ended questionnaire is to attempt to understand people's preference system as associated with their urban environment and thus help the researcher to fulfil the objectives of the research.

The open-ended questionnaire intended to evoke responses about characteristics that are important to people of their own urban environment. The summary of the open-ended questionnaire is as follows:

The kitchen, living room, space, the area and the neighbourhood were the most frequent answers explaining satisfaction in the house. The most important things not preferred about the house according to the respondents were materials, location and lack of space. Sustainability advocates re-use of existing buildings and local materials for greater energy efficiency.

The most prevalent things preferred in the neighbourhood according to the respondents were shops, the location of the neighbourhood and park. Providing shops, amenities and mixed uses are important (see Chapter 1) to fulfil social goals.

Attributes favoured in street life according to the respondents were shops, restaurants, and people. The most important reasons mentioned by the respondents are that these facilitate communication, that there are more people, that people meet each other, and that these are good amenities.

According to the respondents the most important thing attributed to the place of work was proximity. The most important reason mentioned by the respondents is the distance necessary to get to work (commuting distance) which represents a major problem for many people. Proximity is important for sustaining urban form and urban systems. Proximity creates urban vitality and social cohesion in addition increasing availability of time for social activities and interaction as was discussed in Chapter 1.

The most disliked aspects of the place of work according to the respondents were the distance, isolation, noise and wages. Longer distances between residential areas and work place means an increase in car use which has more impact on our environment in term of traffic, noise and pollution (these are addressed in Chapter 6). For a more sustainable urban system it is necessary to reduce the distance between home and work place. Social factors significantly affect the neighbourhood, the community and the planning of the city. The social dimension is concerned with the results of interaction between individuals.

This section shows the importance of certain dimensions such as: **location, proximity, distance and social ties** in the interpretation of people's perception of their urban environment which are important in terms of sustaining the urban system. They were also addressed in Chapter 1 in relation to sustainability. Those dimensions interact with each other as a whole system, so in reality they are one whole not perceived as independent components as is described in Chapter 2 (Transactional Approach).

Part Three

Discussion

Chapter 9: Case study Outcome

Conclusion

Chapter 9

Case Study Outcome

CHAPTER 9
CASE STUDY OUTCOME

9.1- Introduction

In the previous chapters of this research, which concerned mainly the empirical work, the author explored people's evaluations of their urban environments. This was conducted by applying a questionnaire and an open-ended questionnaire which enable him to obtain a better understanding of the interpretation process.

Initially the author was interested in understanding man-environment relationships as a way for sustaining the urban environment through people's perception. However, in the process of doing this research, the author has come across many other important areas that have enhanced his approach to the response of the main research objectives.

The value of a contextual way of examining an environmental phenomenon is that it enables one to find out what the problem is, and to look for clues or notions as to how it might be solved.

The main objective of this chapter is to tie together these findings and put them in a framework. This framework will address the phenomena of the main problem, which were elicited from the research. This framework will introduce a language shared by all and by which people can have an equal and shared understanding.

The observation of the contrasting qualities of both cities and, more important, the systems that developed them, identifies many aspects:

9.2-Quality of the Urban Environment

Evaluating the quality of the urban environment is an indicator that took a large part of the survey questionnaire because the urban environment is part of the urban system. One of the primary objectives of the research is an understanding of the urban systems through people's perception in their own city, by evaluating it. Quality indicator are divided into home, neighbourhood and work variables

The majority of the criteria showed higher satisfaction levels in Edinburgh. The vast majority in Edinburgh (see section 6.10) surveyed were fairly satisfied with their present accommodation. This variable aims to arrive at an overall satisfaction variable for both samples of their home.

Those in the 20-30 age group were more likely to be satisfied with their present accommodation than were older respondents. When satisfaction levels are analysed by household type it emerges that elderly households tended to be less satisfied with their housing; on average young households tended to be more satisfied.

9.2.1-Mix of housing type

Both samples were asked to assess their satisfaction with the house type, it emerges from the survey that the vast majority of the people surveyed from Edinburgh and Ottawa were fairly satisfied with the tenement flat. Apartment flat was the most representative for the two samples in second position was followed by the semi-detached house mainly dominant for the case of Ottawa where the interviewees shows a

satisfaction with this type of house. As described in section 6.6 house type have an impact on energy and sustainability, attached houses type could be seen as more efficient in term of energy consumption than detached houses. Approaches to better and sustainable housing should include considerations about the house type and layout.

Layout considerations such as designing houses to capture solar energy in winter months and to provide cool shaded spaces in summer months. Courtyard designs can be used in cool climates to capture heat, and in warm climates to provide shade, reducing the need for air conditioning. Well-designed courtyards can also provide an attractive communal space, safe for children to play in and conducive for adults to meet in.

A variety of tenancy types should be provided to reflect the socio-economic diversity of the community and to advance social integration. There is a need to include privately owned housing types, co-operative housing, and co-housing. An important goal is to provide a range of affordable housing options.

There is a need to integrate housing of mixed size and type appropriately within the overall community design to respond to a range of household and tenure types, which reflect societal needs. Integration as opposed to segregation accommodates individual and community needs and aspirations.

9.2.2-Security

Security was also mentioned as a reason for dissatisfaction in the house (see chapter 7). Security gives people to enjoy life in a place, whether this feeling is related to job security, financial security or the physical security. This dimension is very important for sustaining the urban systems.

9.3-Lack of Awareness

Samples in Edinburgh showed a lack of awareness regarding the implementation of certain sustainability measures in their home. Interviewees identified two main methods: economic and environmental (see section 6.14). Economic measures include turning off lights, restricting heating by timing and avoiding waste of energy. Environmental measures included: recycling and reusing. Interviewees from Ottawa showed a high level of responses regarding recycling and reusing, in contrast to the sample of Edinburgh where less sample implement recycling and reusing.

People in Ottawa were more aware about environmental and economical measures to sustainability. Minimising waste means reducing the usage of resources and reducing waste outputs to the environment from households and industry. At the level of households minimising waste should be achieved by preventative means (prevention is better than cure).

People see and understand their own urban environment in its context, therefore this understanding or knowledge is relative and is nothing other than culture itself. Societies are facing at the present time a tendency towards a global culture, which is influenced by the methods and approaches coming from all over the world, resulting in a series of conflicts with indigenous and local values. One can cite the example of importation of building materials from Brazil to build a project in Scotland while the use of local materials could create more jobs and so on. This conflict has affected people's awareness of their own cultures and as a result societies are, in a way, detached from their cultures. As a consequence, there is a necessity for increased cultural awareness, with which people could value their tradition in order to sustain it.

Culture can be defined generally as the way of life of a group of people. This is consistent with its definition as a learned and shared pattern of behaviour, characteristic of a group living within fairly defined boundaries and interacting socially among themselves. But culture as a structure of knowledge is not a phenomenon which is subject to the physical characteristic of its particular territory only. Culture extends beyond its geographical boundaries to include an interpretation of the world. Culture is also capable of interpreting other cultures and the way in which other people construe the world. This is a very distinctive view of culture which relates it to nature and the universe as opposed to those views which relate culture to technology, history, economics or other ideologies. Culture, as well as concerning values and thought, also includes other more conspicuous elements such as artefacts and behaviour. Behaviour is particularly important in understanding the individual and the group and how they connect to the environment. A person's behaviour is based on a commonly shared system of values, beliefs, and attitudes, which are pertinent to a society.

9.4-Appropriate Technologies and Materials

Both samples in Edinburgh and Ottawa have shown similarities towards their satisfaction to building materials (see section 6.12). Use of appropriate material contributes to sustainability. Technological solutions to environmental problems too often tend to work against nature, to be more expensive than they need to be and to create work as the preserve of a scientific elite by creating products which ordinary people cannot understand or service themselves.

9.5-Mixed Use Forms

Mixed use is far more prevalent in Edinburgh than in Ottawa (see section 6.18). The Edinburgh interviewees made clear their preferences towards mixed use. Mixed use is meant to reduce use of the automobile and create stronger vitality in the urban environment. Another key requirement of the compact city is that residential, employment and leisure uses should be brought together.

The Edinburgh sample, through observation, is more appreciative of mixed use than in Ottawa. This variable proved to be statistically significant.

A good mixed use and high density often go together as do sprawl and homogeneity of use. High density living and mixed-use achieve some social goals in that they create an urban vitality and promote social cohesion to some extent, in addition to increasing availability of time for social activities and community interaction.

Mixed land use has become a sought after quality as a consequence of the environmental impacts of segregation and the use of zoning laws. Urban form has become aesthetically monotonous and social life has lost vitality because of the loss of a multitude of diverse experiences when previously a larger number of activities were found in an urban environment. Segregation and uniformity have affected both the social and physical characteristics of the built environment. Uniformity and segregation are not only a result of zoning by laws, but also of a need portrayed by current forms of activity as identified in large business. Prevailing trends towards large-scale activities have also promoted uniformity. Commercial activities for example, instead of having the ability to become more evenly dispersed throughout the urban environment as seen

in small shops, have become centralised with the advent of the superstore. Factories have likewise replaced small shops.

Planners and urban designers must learn to strike the correct balance between segregation of hazardous land uses and structuring uses in their settlements to enhance social life.

There is a need to promote poly-functional rather than mono-functional settlement patterns in Ottawa, by providing compact urban centres, with a broad range of services and amenities, in close proximity. These could include commercial and retail shops and life/work housing units among others. Compact centres reduce the tendency towards urban settings 'deserted' after business hours by providing opportunities for continuous activity on streets. Increased street activity enhances real and perceived safety. Providing for the needs of a community at the neighbourhood level reduces the need for vehicular and public transport, thereby decreasing demands on infrastructure and energy resources while promoting pedestrian accessibility and community.

9.5.1-Shops and shopping centres

Shops increase contact between people. They allow communication and interaction to flourish. Interactions with a large number and variety of people and groups lie at the core of the concept of communities, that is, organisations with sustained interpersonal relationships, because this not only fulfils the need for affiliation and belonging but offers an opportunity for a wide range of human behaviour.

Today's, shopping centres have become a fact of urban life and have a major presence upon the social and urban environment. They provide a complete commercial

experience within covered and air- conditioned spaces, an experience which includes parking, shopping and entertainment. Shopping centres such as the Gyle and St James Centre in Edinburgh and the Billing Bridge, Laurier in Ottawa introduce revolutionary values into urban life that have many implications. The new mega-commercial centres understand only a need for commerce and the gathering of like-minded people. People use them not only for shopping but also for other daily needs. Moreover, many people use them as a way of entertainment. Life becomes a series of isolated events, nodes and activities between home, shopping, recreation and work. The biggest consequent problem is social one: the malls have become a series of unconnected events, islands of activity and life, separated by roads, parking lots and sprawl. Lacking are the pedestrian connections and the social contacts that these connections bring. The hostile parking environment that surrounds the shopping complex serves to accentuate its isolation from the larger environment.

9.6-Implementing Social Interaction

This variable aims to give an indication of the level of social interaction in both of the samples. The importance of this variable is not only in the guidance it gives towards assessing the quality of the neighbourhood environment also community relations and cohesion. This variable shows statistical significance. The majority of the interviewees in Edinburgh were fairly satisfied with social interaction (see section 6.20).

Respondents were asked to access their satisfaction on social interaction. Sample of people surveyed in Edinburgh were fairly satisfied with social interaction, while 30% were neither satisfied or dissatisfied and 42% in Ottawa were fairly satisfied about their neighbourhood.

Social and cultural forces have become important in man's evolution because they largely decide the goals towards which societies are moving. Cars obstruct the pursuit of social objectives. They are noisy and intrusive, they carve up neighbourhoods and they encourage fear and isolation. High road traffic, noise and danger are intolerable, which makes people stay away from the streets and use them as little as possible. This reduces trade for businesses and makes residences less desirable so the whole character of the neighbourhood changes.

The street with heavy traffic has relatively little social interaction and residents were found to have fewer friends and acquaintances. On lightly trafficked streets residents were found to have three times as many local friends and twice as many acquaintances as those on busy street.

Social interactions between members of the community contribute to fulfilling social goal of sustainability (see Chapter 1 section 1.7). Enhancing social interaction enhances the cohesion between people which will contribute as well to the improvement of the quality of life and therefore to the built form as is suggested in Chapter1.

9.6.1-Relationships with neighbours

This variable aims to discover the strength of the relations between neighbours. This variable shows statistical significance (6.20.1). In the Edinburgh sample the most common response was that neighbours 'look familiar' and also 'say hello', while in Ottawa the most common response was that neighbours just 'say hello' and 'look familiar'.

People were asked how they described their relationships with their neighbours in order to access the degree of relations between neighbours. Different levels of relations were mentioned such as visiting and talking with neighbours, borrowing things or knowing them by name.

9.6.2-Neighbour familiarity

This variable is meant to discover the scope of the neighbourhood, i.e. how far do neighbours know each other (see section 6.20.2). 29% (16) know their neighbours only next door 16% (9) know their neighbours at street level, 4% (2) know the whole neighbourhood.

Social interaction and activities in settings depends on appropriate cues and their relation to unwritten rules. The relation of social and spatial structure is mediated by norms, shared rules. Spatial structure not only reflects but also influences social structure (Rapoport 1977: 270).

There is a need in Ottawa to promote more social variables and a culture supportive environment this could be achieved through promoting associative activities and reducing sprawl. The most important contribution of the designer should be to facilitate human contact through the organisation of spatial structure. Designers should be sensitive to the current life styles of the people and their proposal should attempt to maintain the inhabitants' values and social behaviour. Social spaces encourage contacts between individuals and groups in both indoor and outdoor settings. Social spaces are seen to be important catalysts to the advancement of individual and societal well being. Essentially, these spaces are associated with the public or semi-public realms of urban settlement. In Ottawa, social spaces could be planned and designed to promote

community interaction and to facilitate the programming of neighbourhood event and functions. These could include shared facilities as well as local gathering places.

9.7-Good Quality Services and Facilities

One advantage of cities is that they can support the provision of high quality cultural and recreational facilities and services. In general the larger the population the better the range, choice and quality. Culture and entertainment are singled out by the UK Sustainable Development Strategy as the distinguishing advantages of cities which 'should encourage people to want to live and work'.

9.7.1-Shared facilities

There is a need to promote interaction among residents in Ottawa through the use of shared facilities and common buildings. These can include: neighbourhood recycling centres; facilities. Another important goal is to reinforce community stewardship of the built as well as the natural environment through a more with less strategy. Community owned and operated amenities helps to reduce individual reliance on consumer products and to reduce the cost of living while providing a higher quality of life.

9.7.2-Location

All respondents were asked to assess their satisfaction with various aspects of their property. House location was one of the attributes frequently mentioned (see section 6.11). Respondents interpreted location as referring to areas close to the town centres where many facilities and different activities, such as colleges, shops and schools, were found. This variable is highly significant.

Location is related to sustainability and to urban systems. The distribution of different activities in the city and their locations could have significant impact on distance energy.

Samples in Edinburgh have shown higher satisfaction to location than the samples from Ottawa (see section 6.11). Location was frequently mentioned, as a main reason liked for living in the neighbourhood. It is important to understand it in term of sustainability. Residential location usually follows employment. People who cannot afford expensive trips and frequently change jobs, locate near centres of employment.

Being close to amenities such as shops and schools means people need to travel less by car and they need to commute less to their place of work. This has an impact on energy use as well as on travel distance and the need for road construction. Proximity also creates urban vitality and social cohesion in addition to increasing availability of time for social activities and interaction.

9.8-Home-Work Relationships

Life and work relationships (see section 6.23.1) shows statistical significance. The vast majority of people in Edinburgh stated that they take a short ride to go from home to work and half of the interviewees stated that they work and live in the same neighbourhood, contrary to the samples in Ottawa, where the interviewees work far from home. Correlation analysis has shown similar a high correlation between home work relationships in Edinburgh.

9.8.1-Density

The effect of low density on transportation is visible in the act of daily commuting in Ottawa. The separation of work place from residential area, forced by large-scale land use segregation, means that very few people can walk to work. Higher mixed densities could be associated with reduction in travel demand and the encouragement of shifts towards emission-efficient modes. The dispersal of population from major centres has been associated with increases in travel demand and a shift away from public transport towards the private motor car.

9.8.2-Re-selection of the work place

This variable looks at people's desire to re-select their working place close to where they live (see section 6.23.2). The vast majority of the interviewees in Ottawa were in favour of a reselection on the basis of proximity to their living place. This notion contributes to sustainable urban systems.

9.8.3-Proximity to public transport

Being close to public transport will provide easy access to facilities and work place. Public transport contributes into sustaining the urban environment.

The separation of workplaces from residential areas in Ottawa, forced by large-scale homogeneity and segregation, means that very few people can walk to work in Ottawa. In addition, because of the low density prevalent in many residential suburban areas, people have no way of getting to work except by car. Ottawa is based upon intensive use of the private car. This has resulted in the segregation of activities and land use. Such forms of development are inherently unsustainable as they lead to the increased use of private transport which is energy demanding and are also not available to the

whole population. Unity within the built environment has been badly affected by the concepts of car domination and traffic segregation.

Politicians, traffic engineers and planners must stop giving priority to the motor car and assisting the destruction of the environment. Another effect of segregation is the separation between home and work.

In many industrialised cities, most noticeably in Canada (Ottawa), the process of urban development have advanced far beyond the functional requirements of various activities. In most downtown's, life stops at the end of the working day because there are no downtown residential areas; most residential areas are socially homogeneous zones, where people of the same social class live segregated from the rest of the population. Present day segregation and homogeneity in land use are forced upon most members of a population regardless of their individual wishes and choices. Furthermore, segregated area are much larger today than they were in pre-industrial cities, and homogeneity is extended to practically every activity, leading to a reduction in social exchange.

9.8.4-Segregation and homogeneity

Land use segregation is not only the result of planning practices; it also appears to be responsive to some cultural requirements found in urban areas of industrialised countries, especially in Northern America (Canada). The basic characteristic of these cities, that of being formed by the aggregation of large zones of homogeneous use, can be traced to the effects of socio-cultural preferences, formalised and reinforced by the planning profession.

Most North American and Canadian cities are based upon maximum use of the private car. This has resulted in the segregation of activities and land uses. Such patterns of development are inherently energy-use intensive as they lead to the increased use of private transport which is energy demanding and also is not available to the whole population. Unity within the built environment has been badly affected by the concepts of car domination and traffic. It is important to re-establish humane public spaces. Politicians, traffic engineers and planners must stop giving priority to the motor car and assisting the destruction of the environment.

9.8.5-Distance and time

This variable shows a statistical significance. Time spent for daily commuting to work is higher in Ottawa than in Edinburgh (see section 6.22.5). Commuting time contribute to sustainability the coming section will elaborate on time waste.

In Ottawa daily commuting distances were much longer. This variable shows a marked statistical significance. Commuting distance contribute to sustainability. The notion of time waste on transport and distance to work could have an impact on economy and social life. Long distance has replaced short distance to work; increasing distance has also increased space for motorways, which had many environmental consequences, such as the destruction of land and pollution as described earlier.

Time has to be saved rather than enjoyed and in a subtle reversal of historical priorities anything that saves time is a good thing and anything that wastes it is a bad thing. Time is a valuable resource which should be conserved so that it can produce socially useful products. The urge to save time is fuelled by the belief that the next task is more important than the present task and that speed and crowded diaries correspond to social

importance. This is pollution of the mind where no one has time for a leisurely exchange of views with a friend or colleague or for the kind of social interaction that nurtures community. The production of community needs an investment of time and energy in contact with neighbours and local groups. The opportunities for such contact depend on time available and priorities. The ability to travel longer distances (and save time at higher speeds) means that no time is available for intense interaction with neighbours and groups and so there is little chance of genuine community developing.

Time and distance, therefore are central to notions of sustainability. A sustainable city or a sustainable transport policy or a sustainable economy cannot be founded on economic principles, which through their monetarisation of time orientates society towards higher levels of motorization, faster speeds and greater consumption of space.

Reduce distance between activities will reduce time and contribute to sustaining the urban systems. There is a need to reduce distance between activities in Ottawa, especially between home and work, this will encourage reduction of energy and pollution of the environment.

9.8.6-Reduction of sprawl

There is a need in to limit low-density suburban development on the peripheries of Ottawa and Edinburgh. Reducing sprawl endeavours to balance developed and undeveloped land through an integrated approach within a well-defined and limited development area. Sporadic suburban development often utilises valuable agricultural, grass or forestland which is essential to maintaining the function and integrity of our natural systems. Alternatively a growth strategy recognises rural and natural functions and land use together with urban functions such as transportation, employment and

mixture of uses, housing and other integrated components of community design. It also serves to protect undeveloped lands through a planning and design strategy that considers growth as well as the carrying capacity of the land.

9.8.7-Energy efficiency

This variable looks at the satisfaction of the interviewees with the energy used on transport (see section 6.22.6). Interviewees in Ottawa were fairly satisfied about energy used on transport by only a few of the interviewees from Edinburgh. This variable marked a statistical significance. Rapid growth in car ownership has permitted more dispersed patterns of urban development which require longer journeys for most daily activities (as is seen in Ottawa) and have become increasingly difficult to serve by energy-efficient modes of transport.

For a sustainable urban development measures should include reducing the need for movement and to provide favourable conditions for energy-efficient and environmentally friendly form of transport should be included.

9.8.8-Reduction of use of automobile

The use of car is much higher in Ottawa than in Edinburgh because Ottawa is characterised by sprawl and segregation of activities. The car is necessary to meet one's daily needs and as transport to work. In Edinburgh the prevalent mode is walking, which indicate a better use of more environmentally friendly modes of transport.

9.8.9-Traffic

Traffic represents a main thing disliked in the neighbourhood (see chapter 7). Excessive car use and traffic congestion are very closely related. As argued in Chapter 1 advocates

of sustainable urban environments encourage the reduction of car use on account of its a negative impact on cities such as traffic pollution and noise. High road traffic levels can also have major impacts on the level of social interaction and community cohesion. Increased road traffic is directly related to alienation.

9.8.10-Proximity

Promoting proximity between activities contributes into sustainability as well as between homework. Similar to the previous point, there is a need to promote proximity for a more sustainable urban systems.

9.8.11-Wage

Wage was also mentioned as a reason disliked in the work place. Wage contributes to sustainability and to economic goal (see Chapter 1 section 1.7.3). Providing reasonable earning could help to maintain people in their place.

9.9-Pollution

Activities that contribute to pollution are heavy industry and the use of the automobile. The use of car is much higher in Ottawa than in Edinburgh (see section 6.22.2) because Ottawa is characterised by sprawl and segregation of activities. The car is necessary to meet one's daily needs and as transport to work. In Edinburgh the prevalent mode is walking, which indicate a better use of more environmentally friendly modes of transport.

CONCLUSION

Review

In the past thirty years, cities have grown at a phenomenal rate. This abnormal growth is mainly caused by urban expansion that overwhelms the balance between natural resources and the morphological characteristics of each region. Today's typical sprawling housing developments, shopping centres, highways and other developments emerged from design principles that did not originate from any sense of the environmental context or to humankind's relation to it. Many problems caused by urban growth, such as pollution, energy, segregation, sprawl and lack of social and cultural consideration have become unsustainable to the urban environment.

Through the literature review, the fieldwork and the case studies, this research seeks to contribute to the discourse on sustaining the urban environment. Many authors on sustainability look at solutions for unsustainable cities from an objective point of view, mainly as a set of problems to be resolved through advanced technology and progressive innovations which thus form the basis for solving the problems of societies. As a result of the emphasis and focus on the objective aspects subjective social forces have become overlooked and it is these that established a threat towards maintaining a sustainable environment.

The author of the research first proposed hypothesis to address sustainability from a subjective point of view which came from deep-rooted aspects, social and cultural values that are embedded in people's value system shared by the collective minds. The

hypothesis is achieved through people's perceptions of their built environment as a tool to understanding the man-environment relationships.

The researcher holds a deep belief that understanding the human ecological system is a way to understanding the urban built environment that is transformed by it. Urban built form then becomes a process that constantly adapts to social and environmental conditions and never reaches a final outcome. Only within this context can the form of the urban built environment be properly understood.

The first part of this study consists of three chapters. These examine the theoretical backgrounds of sustainability, the transactional approach and perception. The role of investigating sustainability is to shed more light on the problems caused by urban growth which has had many impacts on the environment such as: pollution, waste of energy and segregation of activities. Sustainability is a wide-ranging concept compatible with holistic modelling in that it defines 'holistic' by first defining many aspects of human well being.

The transactional approach recognises people as being intrinsic parts of the whole system that interact with their urban environment. People and their relationships with their urban environment are systems that can not be dissociated. The transactional approach also helped understanding how urban systems are interconnected. People and their surroundings interact between each other and form a single system. People, processes and environments are perceived as aspects of a whole, not as independent components that collectively combine to make up a whole. Context, time and process are but aspects of an integrated unity. A fundamental postulate of the transactional perspective is the unity of the organism and the environment, thus refuting any models

that deal with separate elements of a system; the transactional approach deals with them as a whole.

This part also examines perception and cognition. Gathering information is related to perception, whereas processing is related to cognition. Perception is defined as an active process in which the whole individual is involved. In perceiving the environment, the perceiver constructs it and the result of the perceptual elaboration is individual to each person. The term environment is also defined as a series of relationships between elements and people.

The second part of this study investigates the case studies in chapters four, five, six and seven. In chapter four it is necessary to introduce the two cities where the case studies took place. Chapter five then introduces the method of questionnaire and explains the method of sampling as well as the type of statistical analysis used to analyse the questionnaire. In chapter six an analysis based on frequencies looks at the two cities. The empirical analysis helps the author to develop a better understanding of the issues of sustaining the urban systems.

Chapter seven uses another type of analysis which is based on correlation and factor analysis from a transactional point of view that helps the researcher to have a better picture as to what extent people's perceptions of the two cities are inter-connected. Chapter eight analyses the open-ended questionnaire distributed in Edinburgh separately (agreed with the supervisor) from the questionnaire, the purpose is to have a better understanding of how people's perception is structured and grouped by categories. The last part of this study is concerned with the outcome of the results and conclusion (chapter nine).

In sum, this thesis establishes an understanding of urban systems using Edinburgh and Ottawa as a case study in a specific context. It justifies this using the transactional approach, perception and cognition to elicit knowledge and to generate an understanding of factors and the dimensions that must be addressed in order to maintain a sustainable entity rather than putting emphasis on objective investigation and physical analysis.

Method

The philosophical approach adopted by the research is that of transaction, context and cognition. The aim of adopting these approaches is to counter in part the current attitudes in research into sustainability which address it from physical and objective perspectives and ignore largely the feedback which should come from people and from understanding their behaviour, attitudes, perceptions and preferences. Such objective approaches may not help in creating an attitude which is sustainable from the point of view of people who have the knowledge of their own system. This framework has been tested and the outcome was that the researcher received much information as a direct result of adopting these methods.

In order to observe the theoretical framework of the study, it was necessary to apply it in two case studies, for which Edinburgh and Ottawa were chosen. Any case study could have been used to explore people's evaluation in their urban environment. The familiarity of the author of this research with Edinburgh and Ottawa gave him the possibility to explore the cities with a clear awareness of their differences and similarities. The case studies were conducted using mostly on-site observations, extended survey questionnaires and open-ended questionnaire. The factors relating to

the quality of the urban built environment were divided into sections relating to the dwelling, to the neighbourhood and to urban forms.

Survey Outcome

People's Preferences system and Satisfaction

Home and Neighbourhood satisfaction

By way of adopting a methodology that distils people's opinion and satisfaction with their environment the researcher comes across many points that contribute to sustaining the urban environment from deep rooted aspects embedded in people's value system and perception. People's evaluation of the quality of their urban environment is an indicator that takes up a large part of the survey questionnaire because the urban environment is part of the urban system. People see and understand their own environment in its context.

Satisfaction with the dwelling was significantly higher in Edinburgh in most variables. Variables for satisfaction with the neighbourhood were also more highly rated in Edinburgh. In general, the built form at the city scale in Edinburgh was found to be more satisfactory for most variables than in Ottawa.

Home satisfaction: Location and materials

People relate their satisfaction with the home to location; the main reasons mentioned were quietness and proximity. Materials are not seen only as an objective entity from the point of view of people but as feelings; 'thin wall' seen as unsafe and 'thick walls' as safe, 'stone wall' was seen as long lasting and 'thick wall' as sound proof. Space was also mentioned as relaxing and convenient in the home.

Home-Neighbourhood Relationship

Correlation analysis has shown a strong relationship between home satisfaction and neighbourhood satisfaction. This satisfaction not only derives from the physical aspects but from subjective aspects in term of values, needs and preferences.

Sense of community

Sense of community was mentioned as a reason the neighbourhood was liked in the open-ended questionnaire. People being friendly was linked to satisfaction in the work place, which contributes to the social goal of sustainability.

Spatial, physical, psychological, natural, social and economical dimensions

The hypothesis of this research sees it as important to address sustainability from a subjective point of view, which comes from deep-rooted aspects embedded in people's value systems and shared by the collective mind.

As a result the analysis of the open-ended questionnaire identified six dimensions which contribute to sustaining the urban systems these were: the spatial dimensions represented by proximity, location and space; the physical dimension represented by shops, materials, traffic, distance, car and transport; the psychological dimension represented by safety, security, isolation, comfort and convenience; the natural dimension represented by park, nature and landscape; the social dimension represented by social life, sense of community neighbours and friendliness of people. The economical dimensions represented by wages, cost expense and cheapness.

Land use, mixed use and transport relationships

The study has shown a strong satisfaction and connection between land use, mixed uses and transport in Edinburgh, mainly caused by the high-density form by which the city is characterised.

Satisfaction with mixed use

People in Edinburgh show a strong appreciation of mixed uses. Edinburgh has a greater evidence of mixed land use accompanied by the use of more environmentally friendly modes of transport such as the bicycle and walking. In Ottawa there is less appreciation with the mixed use and the car is the dominant means of transport. Building density in both cities is different being greater in the case of Edinburgh. High density living and mixed-use achieve some social goals in that they create an urban vitality and promote social cohesion. The majority of the interviewees in Edinburgh were fairly satisfied with social interaction. Cars obstruct the pursuit of social objectives. Social interactions between members of the community contribute to fulfilling social goal of sustainability.

High density and proximity are also related as in Edinburgh the study shows people get all their basic needs near by and work place are within proximity to the home. Proximity also creates urban vitality and social cohesion in addition to increasing the availability of time for social activities and interaction.

Sprawl and low-density land use supported by car use was dominant in Ottawa. Distance to work was much higher in Ottawa than in Edinburgh, the desire to be close to work place was mentioned by people wanting to relocate their home.

Satisfaction with Life-Work Relationships

Satisfaction with life and work relationships shows statistical significance in Edinburgh. Correlation analysis has similarly shown a high correlation between home and work relationships in Edinburgh. The separation of workplaces from residential areas in Ottawa, forced by large-scale homogeneity and segregation, means that very few people in Ottawa can walk to work. Unity within the built environment has been badly affected by the concepts of car domination and traffic segregation. The time spent for daily commuting to work is therefore higher in Ottawa than in Edinburgh and the daily commuting distances are much greater. Reducing commuting distances contributes to sustainability. Reducing distances between activities also reduces time spent moving between them and contributes to sustaining the urban systems. There is a need to reduce distance between activities in Ottawa, especially between home and work, this will encourage reductions of energy use and pollution of the environment.

Interviewees in Ottawa were fairly satisfied about energy used on transport by only a few of the interviewees from Edinburgh. The use of the car is much higher in Ottawa than in Edinburgh because Ottawa is characterised by sprawl and segregation of activities. There, the car is necessary to meet ones daily needs and as transport to work. High traffic levels were also shown to have major impacts on the levels of social interaction and community cohesion.

Environmental Awareness

Conversely to the findings related to transport, people in Ottawa were more aware of environmental and economical measures to sustainability. This research identifies a deep lack of awareness among people in Edinburgh, the author would like to emphasise on the importance of this issue on sustainability.

Creating awareness among individuals

Most people get their information on environmental matters from television, radio and newspaper; people also learn from schools. The author would like to expand on the issue of education and relate it to the discourse of sustaining the environment.

Education

Education and training are crucial to the achievement of sustainable development. They can provide people with an understanding of how the environment relates to everyday issues and what action they can take personally to reduce their own impact on the environment at home, at work or in their leisure activities.

School education

Children need to understand the relationship between human activities and the environment, and the concept of sustainable development. Schools have a vital role to play in both formal and informal environmental education. Opportunities to study a range of environmental issues arise, in particular, through the study of the impact of pollution on our environment and health, science and technology. Other subjects can provide a context for pupils to examine environmental issues. Teachers need support to help them give effective environmental education, Higher education institution should assess what assistance teachers need. A range of professional development opportunities in the field, including training courses could help update teachers knowledge.

Individual Action

Sustainable development depends on changes in individual lifestyles: using the car less, saving energy, recycling and choosing environmentally-friendly products. This research shows that people in Edinburgh do not recycle nor do they save energy. Translating positive environmental attitudes into actual behaviour is therefore a key challenge for the future.

Survey Conclusion

The outcome of the survey was a consequence of adopting people's opinions as a tool to test the hypothesis, which is to provide an understanding towards sustaining the urban systems from subjective aspects. The application of two different contexts helps the researcher to enrich his understanding of how to sustain urban systems.

The urban environment can be seen as whole living system, where mutual interactions between people and their surroundings occur. Through the people that inhabit this system, different processes occur. When there are good social relations and interactions between the individuals, good communication takes place and interactions are sustained. At an urban level, segregation of activities and transport contributes to unsustainable situations and has environmental impacts such as excessive pollution and safety hazards.

Sustainability is an ongoing process in order to maintain and enhance a sustainable urban environment people need to be aware of the importance of the environment which surround them.

The author of the research would like to emphasise the importance of:

- People's knowledge systems (endogenous knowledge) to sustainability and sustaining the urban environment; and
- The context; and
- Participation approach to sustainability.

Recommendations

The observations of the qualities of both cities identifies many aspects that emerge from adopting a methodology that distil people's opinions as a tool to test the hypothesis that sustaining the environment could be seen not only from the physical aspect (objective) but from other aspects (subjective).

The researcher condenses his understanding in the issue of sustaining the urban systems in Edinburgh and Ottawa into two different sets of recommendations related to sustaining the urban systems as follows:

Recommendations Applied to Edinburgh

	Recommendations	Criteria	Agencies
Ecological/	-Reduction of pollution, promoting a healthy living, and maintaining the natural environment for people in Edinburgh to enjoy. Improve the quality of Edinburgh's lives by the use of a more environmentally friendly mode of transport. -Reduction of waste	-Encouraging pre-recycling campaigns in order to educate consumers to consider waste before they buy. -Establish more recycling centres in Edinburgh in order to recover and process everything from glass, metal, paper and waste.	Edinburgh city council: Planning Department

	Recommendations	Criteria	Agencies
Economical	-In the light of environmental objectives, would include finding economic activities that are less polluting; the production of recyclable products and diverting the benefits of economic growth to pay for the provision of environmental protection. -Promoting adequate wages for employees in their job.	-Promotes economic development in such a way as to protect and enhance the environment in Edinburgh.	Edinburgh city council Employers

	Recommendations	Criteria	Agencies
Social	-Enhance social life, social cohesion, a sense of community and citizenship and interaction, as well as promote life styles that do not alter Edinburgh's environment. -Encourage mix of tenancy type to reflect socio-economic diversity.	-Encouraging more social activities which facilitate contact.	Edinburgh city council Architects, planners, urban designers

	Recommendations	Criteria	Agencies
Urban form	-Promoting The quality of the urban environment, by looking at people satisfaction in Edinburgh's environment. -Promoting a stronger home work relationships; -Taking into account the location of different activities in the city; -Proximity planning: to make access by proximity rather than access by transportation	-Encourage close home and working environment.	Planning authorities Planners, urban designers

	Recommendations	Criteria	Agencies
	-For a sustainable system safety consideration is very important in Edinburgh. -Security contributes to sustainable urban environment. People want to feel safe and secure within their own environment. -Promoting more security around neighbourhoods in Edinburgh for a sustainable urban environment.	-Encouraging security and safety measures such as neighbourhood watch	Neighbours Architects, planners, urban designers

	Recommendations	Criteria	Agencies
Natural environment	-Promote a healthy environment in Edinburgh by creating open spaces and parks, planting that absorbs pollutants and for people to enjoy. The natural environment plays a major role in moderating the impacts of human activities, the role of plants in absorbing pollutants and releasing oxygen.	-Encouraging tree planting around neighbourhoods in Edinburgh which is important in filtering local air pollution, providing noise barriers, providing visual screening and enhancing neighbourhood identity.	Planners Urban designers Architects Landscape architects

	Recommendations	Criteria	Agencies
Listen to the public (awareness)	-Professionals in Edinburgh should be open minded and willing to learn from people. Professionals can propose but not impose. -Edinburgh city council should consider people's satisfaction and participation in the planning process towards achieving a sustainable environment. -Community based organisation could be facilitated in addressing community needs. -Encouraging contact with community representatives through meetings and discussions help to understand those needs that can be addressed later by the local authority. -For a transactional point of view promoting awareness among people on the issues of sustainability is needed.	-Encourage meetings with the public. -Encourage awareness in Edinburgh by training and educating people, and make them aware about their responsibilities. -Provide an understanding of how the environment relates to everyday issue and action . -Promote children understanding the relationship between human activity and the environment -Build a united broad-based political coalition for progress on sustainable community development.	Planners, architects, urban designers) Edinburgh city council Edinburgh city council Planners, architects, urban designers

	Recommendations	Criteria	Agencies
Urban form	**Location** Location is related to sustainability and to urban systems. The distribution of different activities in the city and the distances between their locations could have significant impact on energy consumption. Location determines the specific effect and interrelationships of urban system acting upon a particular site. Loosely distributed locations, reflected in the dispersion of population and employment and the creation of dispersed centres results in wasted resources. For a sustainable form promoting a more tightly distributed location.	-Promote tight distributed locations	Planning authorities planners, urban designers

	Recommendations	Criteria	Agencies
Physical	-Encourage designers to pay particular attention to the recycled contents of building materials derived from scarce non-renewable resources, such as: increasingly scarce metals; plastics made from petroleum products, other materials such as concrete, requiring large amounts of petroleum energy for production. These should be selected with as high a recycled content as possible, and limited to applications where they contribute to the overall longevity of the building, have no economical substitutes, or are designed for reuse/ recyclability. Architects and designers can help ensure that innovative products with greater recycled content are available by making this a visible priority in their material specifications and requesting information on recycled products.	-Re-use existing buildings and structures; -Construct buildings and infrastructure out of local and low-energy materials; -Design buildings for long life, with ease of maintenance and adaptability for changing needs. -Encourage Architects and Designer to design buildings for long term; re-use the same materials.	Designers Architects
	-Approaches to better and sustainable housing should include considerations about the house type and layout. Attached house types could be seen as more efficient in their energy consumption than detached houses	-Encouraging attached house type rather than detached for more energy efficiency.	Architects, planners, urban designers
	-Approaches to sustainable layout should take into considerations such as designing houses to capture solar energy in winter months and to provide cool shaded spaces in summer months. Courtyard designs could be used in cool climates to capture heat, and in warm climates to provide shade, reducing the need for air conditioning.	-Promote layouts and housing design towards capturing solar energy	

Recommendations Applied to Ottawa

	Recommendations	Criteria	Agencies
Ecological/ Environmental	-For a sustainable urban system reducing vehicular traffic is necessar in Ottawa: Politicians, traffic engineers and planners should stop giving permanent priority to the motor car.	-Encourage development that gives greater weight to locations and able integrated into effective networks for walking, cycling and public transport.	Ottawa's Municipality
	-Reduction of pollution, promoting a healthy living, and maintaining the natural environment for all to enjoy, significantly improves the quality of Ottawa's lives by the use of a more environmentally friendly mode of transport.	-Rules to give importance to walking form as a part of an integrated approach to transport. Encouraging urban areas that are attractive and safer for pedestrians, including people with mobility difficulties.	Architects, planners, urban designers
		-Rules has to restrict the automobile in Ottawa: to reduce urban air pollution, traffic congestion.	Ottawa's municipality
		-To encourage access on foot, the pedestrian should be given priority over other modes. Reinforce detailed design which seeks to reduce traffic, speed, restrict the movement of vehicles and give pedestrians priority over vehicles.	Designers, Architects, planners, urban designers
		-Promote trip reduction in order to reduce peak hour trips and increase the ratio of people to vehicles.	Ottawa's municipality

	Recommendations	Criteria	Agencies
Economical	-Promoting economic activities that are less polluting; -Promoting a stronger homework relationship is a way towards a sustainable urban system in Ottawa. -Promote efficient use of resources in Ottawa.	-Promoting economic development in such a way as to protect and enhance Ottawa's environment, now and for future generations. -Decentralisation of activities.	Ottawa's municipality

	Recommendations	Criteria	Agencies
Social	-Enhance social life, social cohesion, a sense of community and citizenship and interaction, as well as promoting life styles that do not alter Ottawa's environment. -Encourage mix of tenancy type to reflect socio-economic diversity. -Encourage the citizen, the family and local community to take responsibility.	-Encouraging more social activities which facilitate contact.	Local authority Architects, planners, urban designers

	Recommendations	Criteria	Agencies
Spatial	-Reduce commuting times and distances between home and work in Ottawa. -Promoting proximity of activities for a sustainable system in Ottawa.	-Give greater weight to locations in Ottawa in order to be well integrated into effective networks for walking, cycling and public transport. -Encouraging retail development in Ottawa which is sited where there is a choice of transport and should not be dependent solely on access by car.	Planners Planners

	Recommendations	Criteria	Agencies
Natural environment	-For a sustainable urban environment there is a need to promote a healthy environment in Ottawa by creating open spaces and parks, planting that absorbs pollutants.	-Encouraging tree planting around neighbourhoods in Ottawa which is important in filtering local air pollution, providing noise barriers from excessive car traffic, providing visual screening and enhancing neighbourhood identity.	Planners Urban designers Architects

	Recommendations	Criteria	Agencies
Listen to the public (awareness)	-Professionals in Ottawa should be open minded and willing to learn from people. Professionals can propose but not impose. -Ottawa's municipality should consider people's satisfaction and participation in the planning process. -Contact with community representatives through meetings and discussions in Ottawa's municipalities help to understand those needs that can be addressed later by the local authority. -For a transactional point of view promoting awareness among people in Ottawa on the issues of sustainability is needed.	- Encourage meetings with the public. -Encourage awareness by educating people, and make them aware about their responsibilities.	Planners, architects, urban designers) Local authority Community organisation

	Recommendations	Criteria	Agencies
Urban form	**High density living** -Promote a compact forms of development in Ottawa as a solution to help reduce the tendencies to peripheral urban sprawls and also stimulates urban dynamism and vibrancy. -Reduce valuable time and distance in Ottawa spent in commuting at the expense of social activities -Reduce sprawl form of development in Ottawa by encouraging high-density living. -Promoting a stronger home work relationships proximity between activities in Ottawa.	-Promote more compact use in Ottawa. -Decentralise activities. -The relationship of homes to other uses has a large potential to influence travel demand in terms of transport type and length of journey. Ottawa's municipality should ensure that their settlement strategy is consistent with the aim of reducing travel demand and puts greater reliance on means of transport other than the private car. -Care should be taken to ensure the appropriate use of high density. -Promoting proximity between home and work. Access to jobs and facilities should be a prime consideration.	Planning authorities Planners, urban designers Architects, planners, urban designers

	Recommendations	Criteria	Agencies
	Energy -Discourage Low-density suburbs in Ottawa that demand a high level of mobility for the journey to work and other services. -Encourage energy efficient settlement patterns. -Reduce the physical separation of activities in the interests of energy conservation. -Reduce low-density urban sprawl that generates a greater need to travel than more compact structures of mixed land uses in which the physical separation of activities is small.	-Promote clustered form rather than extensive sprawls. -Promote energy efficient form pattern, with a medium to high density. -Increasing densities or by increasing the variety of land use. -Reduce separation of activities and increase of density through variety of land use. Mix different kinds of land-uses.	Architects, planners, urban designers Architects, planners, urban designers

	Recommendations	Criteria	Agencies
Urban form	**Location** -Discourage loosely distributed locations in Ottawa which is reflected in the dispersion of population and employment and the creation of dispersed centres results in wasted resources.	-Promote tight distributed locations	Planning authorities planners, urban designers
	Distribution -Discourage dispersed distribution which has serious implications for energy and environmental conservation.	-Promote grouped distribution rather than sprawl distribution.	Architects, planners, urban designers
	Mixed land use -Promoting a good mixed use in Ottawa and high density rather than sprawl and homogeneity of use. Encourage both high density and mixed-use urban environments for decreasing the need for automobile transport, and therefore also the need for road construction.	-Encourage mixed land use and reduce activities at the fringe of the city in Ottawa. -Good urban design should aim at promoting mix uses with a high-density design.	Planners, urban designers

	Recommendations	Criteria	Agencies
	House type -Encourage better approaches towards sustainable housing which include considerations about the house type and layout. Attached house types could be seen as more efficient in their energy consumption than detached houses	-Encouraging attached house type in Ottawa rather than detached for more energy efficiency.	Urban designers Architects,
	-Approaches to sustainable layout in Ottawa should take into considerations such as designing houses to capture solar energy in winter months and to provide cool shaded spaces in summer months.	-Promote layouts and housing design towards capturing solar energy.	Architects, planners, urban designers

Achieving these objectives will enhance the urban environment in allowing people to be part of the decision-making process, using their knowledge and resources to transform their physical environment, to satisfy their needs and produce better solutions to environmental problems and how to sustain it.

Research Limitations

There are some limitations that affected the research. These limitations can be summarised as follows:

1) The financial limitation is the major factor affecting any research.
2) Availability of information about the case study. Data collection is one of the hardest tasks.
3) Time limitations of the author.

Further Research

The findings from this research suggest that the relationships between life and work are substantially related to sustainability through the urban environments, forms and perceptions they create. The issues related to this subject are wide and varied; this research takes only a first step and is restricted to its own objectives and limitations. Therefore, some issues lie beyond its scope and need further investigation. The author would like to suggest some directions for further research that could be continued by colleagues who are similarly concerned about sustaining the urban environment.

This study has been concerned with contributing to sustaining the urban system; further research could examine to what extent educational institutions contribute into the topic of sustainability and sustainable environment. Lack of awareness among respondents was apparent; further research might also examine the level of awareness among professionals.

Further research could also be done through the interpretation of politicians and users in the issues of sustainability. Further research could also look at the implications of sustainable design for professionals and design principles.

The previous set of recommendations could be seen as indicators towards sustaining the urban environment. Further research could involve evaluating those indicators, for example by testing these indicators on different professionals and resident groups.

The study uses lay people's satisfaction in their urban environment. Further research could include professionals (such as architects, urban designers and planners) and the local authority in a triangulation exercise intended to develop a more pan-disciplinary awareness of satisfaction and identify points where professional and non-professional attitudes correlate or diverge.

Further research could be undertaken to see how to implement sustainable principles in the education process at schools and to measure pupil awareness on this issue. The end they represent the future generations of urban developments.

Bibliography

BIBLIOGRAPHY

Altman, I (1992) *A Transactional Perspective on Transitions to New Environments*. In Environment and Behaviour Vol. 24, N.2.p 268-280

Altman, I.& Chemers, M (1980) Culture and Environment Cambridge University Press

Altman, I. & Rogoff, B. (1987) *World views in psychology: trait, interactional, organismic and transactional perspectives.* Hand Book of Environmental Psychology. Vol.1. Wiley, New York, p 7-40.

Anderson P, W (1996) *Urban Form, Energy and the Environment: A Review of Issues, Evidence and Policy*. Urban Studies, Vol 33, N.1

Arnheim, R (1969) Visual Thinking. USA: University of California

Arnstein, S (1969) *A Ladder of Citizen Participation.* Journal of American Institute of Planners 35, July: p 216-24

Aspinal, P (1997) *Research Methods Theory Seminars* Edinburgh College of Art, School of Architecture.

Baccaini, B (1997) *Commuting and residential strategies in the ile-de-france: Individual behaviour and spatial constraints*. Environment and Planning A Vol 29 p 1801-1829

Banister, D (1991) Energy Use, Transport and Settlement Patterns Regional Science Association.

Banister, D & Marshall,S (2000) Encouraging Transport Alternatives Marshall, S. The Stationery Office

Barton, H (1991) *City Transport: Strategies for Sustainability* Regional Science Association.

Barton, H (1996) *Sustainable Urban Design*: Going Green by Design. Urban design, Issue 57, Jan 1996

Bechtel, R.B & Michelson (1987) Methods in Environmental and Behavioural Research. NewYork: Van Nostran Michelson, W. Company limited.

Begg M, H (1991) *The Challenge of Sustainable Development* The planner 21th june 1991 p 7

Bentley, I (1985) Responsive Environments: A Manual for Designers. London: The Architectural Press Ltd.

Bertalanffy, L (1971) General System Theory: Foundations Development Applications. Penguin, 1971.

Boardman, P (1978) The Words of Patrick Geddes: Biologist, Town planner, Re-educator, Peace warrior Rkp

Breheny, M (1991) *The Contradiction of the Compact City a Review*. Regional Science Association.

Breheny, M (1992) Sustainable Development and Urban Form. Pion Limited, London.

Bryman, A (1988) Quantity and Quality in Social Research Unwin Hyman Ltd.

Canter, D (1975) Environmental and Interaction: Psychological Approaches to our Physical Surrounding. London: Surry University Press

Castells, M (1983) The City and the Grassroots: A Cross- cultural Theory of Urban Social Movements. Arnold

Cervero, R (1995) *Planned Communities, Self-Contained and Commuting: A cross –national perspective*. Urban studies Vol 32, 7 19 p 1135-1161

Cooper, I (1993) *The Challenge of Sustainability* Paper presented in Edinburgh Conference 1993

Coleman, A (1969) The Planning Challenge of the Ottawa Area Ottawa Geographical Branch, Dep of Energy, Mines and Resources.

Coleman, A (1985) Utopia on Trial: Vision and Reality in Planned Housing London: Hilary Shipman Limited.

Detwyler, T (1972) Urbanisation and Environment: The Physical Geography of the City Doubleday Press

Edwards, B & Hyett, P (2001) Rough Guide to Sustainability RIBA Companies Ltd

Engwicht, D (1992) Towards an Eco-City Calming the Traffic
David Engwicht.

Eysenck, M.W(1984) The Handbook of Cognitive Psychology
Laurence, Erbaun Associate Ltd.

Flavell, J (1985) Cognitive Development
Prentice Hall, Inc.

Furuseth J, O (1997) *Neotraditional Planning: a new strategy for building neighbourhoods*?
Land use Policy Vol 14 p 201-213

Gehl, J (1987) Life between Buildings: Using Public Space
Van Nostrand Reinhold Company New York

Gifford, J (1991) Edinburgh,
Penguin.

Girardet, H (1992)(1996) The Gaia Atlas of Cities: New Directions for Sustainable Urban Living
Gaia books.

Goodchild, B (1994) *Housing Design, Urban Form and Sustainable Development: Reflections on the Future Residential Landscape*.
TPR (Town Planning Review) 1994 Journal 65.

Grynberg, G (1991) *The Theories of Henri Wallon: From Act to Thought Human Development* Vol. 34 p 363-379

Harold, M (1986) Quality of Urban Life
Walter de Gruyter & Co. Berlin. New York.

Haughton, G & Hunter, C (1994) Sustainable Cities,
London.

Hillier, B (1992) *Look Back to London.*
Architects' Journal 15 April p 42-46

Holman, C (1991) Transport and Climate Change: Cutting Carbon Dioxide Emission from Cars.
Friends of the Earth

Ittelson, W.H. (1978) New Directions in Environmental Design,
Proceedings of the Ninth EDRA Conference,
Tuscan, Arizona.

Ittelson, W.H (1973) Environment and Cognition,
Seminar Press, New York.

Ittelson,W.H., (1960) Visual Space Perception
Springer, New York.

Jacob, J (1962) Death and Life of Great American Cities
Cape.

Jenks, M (1996) The Compact City: A Sustainable Urban Form? E and F.N Spon

Jencks, C (1969) Meaning in Architecture USA: Barie and Rockliff.

Kline, P (1996) An Easy Guide to Factor Analysis London: Methuen

Knox, P (1995) Urban Social Geography: An Introduction Longman Scientific & Technical

Lang, J. (1987) Creating Architectural Theory the Role of the Behavioural Science in Environmental Design, Van Nostrand Reihold.

Lang, J (1988) Symbolic Aesthetics in Architecture: Towards a Research Agenda Cambridge University Press

Lang, J (1994) Urban Design: The American Experience New York: Van Nostrand Reihold

Lang, J., Burnette (1982) Designing for Human Behaviour USA: John Wiley and Sons

Leboyer, L (1982) Psychology and Environment Sage publication, Inc. California. USA: Translated by David Canter and Ian Griffith.

Lloyd, J, T (1996) *Curitiba: Sustainability by Design* Urban design, Issue 57, Jan 1996

Lord Provost Commission (1998) Lord Provost's Commission on Sustainable Development for Edinburgh. The City of Edinburgh City Council.

Lozano, E, E (1990) Community Design and The Culture of Cities Cambridge University Press

Lynch, K (1960) The Image of the City Cambridge, Mass: MIT Press

Lynch, K (1972) What Time is This Place? Cambridge, Mass: MIT Press

Lynch, K (1976) Managing the Sense of a Region Cambridge, Mass: MIT Press

Lynch, K (1981) Good City Form Cambridge, Mass: MIT Press

Mc Laren, Moray (1950) The Capital of Scotland a Twentieth Century Contemplation on Edinburgh. Published for the Right Honourable Sir Andrew Murray Lord Provost of the City. Douglas & Foulis Edinburgh

Maf, S (1998) Greening the Built Environment
Maf Smith, John Whitelegg and Nick Williams

Markus, T.A (1982) Order in Space and Society: Architectural Form and its Context in the Scottish Enlightenment
Mainstream.

Miller, S (1984) Experimental Design and Statistics
London: Methuen

Minai, A (1989) Design as Aesthetic Communication: Structuring Random-order; Deconstruction of Formal Rationality.
New York: Peter Lang Publishing, INC

Mittler, D (1999) *Reducing Travel? A case Study of Edinburgh.*
Built Environment Vol. 25

Morray, Mc L (1950) The Capital of Scotland: a Twentieth-century contemplation on 'Edinburgh'
Published for the right honourable sir Andrew Murray Lord Provost of the City.

Murphy, J.B. (1977) *American Planners and Citizen together: A case study.*
Community Development Journal, Vol.12, N.3, p 165-176

Murrain, P (1993) Making Better Places, Urban Design Now
Copyright licensing agency Ltd, London edited by Richard Hayward and Sue Mc Glynn.

Mumford, L (1963) The City in History, its origins, its transformations and its prospects.
Secker and Warburg New York

Neisser,U (1976) Cognition and Reality: Principles and Implications of Cognitive Psychology
W.H.Freeman, co U.S.A

Newman, W P (1995) The Land Use Transport Connection
Elsevier Science Ltd.

Newman, P & Kenworthy, J (1996) *The land use-transport connection an overview*
Land use policy Vol 13 N.1 p 1-22.

Nijkamp, P (1994) Sustainable Cities in Europe: A Comparative Analysis of Urban Energy, Environmental Policy.
Earthscan, 1994

Norberg-Schulz, C (1965) Intentions in Architecture
Cambridge, Mass: The MIT Press.

Norberg-Schulz, C (1971) Existence, Space and Architecture
Great Britain: Studio Vista London.

Norberg-Schulz, C (1980) Genius Loci, Toward a Phenomenology of Architecture
New York: Rizzoli.

Owens, S (1986) Energy Planning and Urban Form
Pion

Owens, S (1991) Energy, Environmental Sustainability and Land Use Planning
Regional Science Association.

Owens, S (1991) *Energy demand: links to land-use and forward Planning.*
The Built Environment Vol 11 N.1 p 33

Peake, S (1994) Transport in Transition: Lesson from the History of Energy.
Earthscan

Piaget, J (1971) Structuralism
Translated by Chaninah Maschler Routledge & Kegan Paul. London

Piaget, J (1977) The Development of Thought: Equilibrium of Cognitive Structure
Viking U.S.A

Porritt, J (1990) *Planning for a Greener Future*
The Planner p 53.

Poteous, J.D (1977) Environment and Behaviour Planning and Everyday Urban Life
Massachusetts: Addison-Weley Publish Company Inc.

Rapoport, A (1969) House Form and Culture
Englewood Cliffs, N.J: Prentive-hall, Inc.

Rapoport, A (1977) Human Aspects of Urban Form
Oxford: Pergamon Press Ltd. New York

Rapoport, A (1980) Cross- cultural aspects of Environmental Design.
In I. Altman, A.Rapoport and J.Wohwill (ed) Human behaviour and environment. N.Y: Plenum Press.

Rapoport, A (1982) Meaning in the Built Environment
Beverley hills; Sage Publications

Roseland, M (1992) Toward Sustainable Communities
Mark Roseland

Sachs, W (1998) Greening the North
Zed books, London

Smith, A (1966) Communication and Culture: readings in the codes of Human Interaction
USA: Holt, Rinehrat and Winston, Inc.

Schumacher, E. F (1969) Small is Beautiful
Vintage, London

Silverman, D (1993) Interpreting Qualitative Data
Sage Publications Ltd

Strauss, A (1987) Qualitative Analysis for Social Scientists
Cambridge University Press

Susskind, L. & Elliot, M. (1983) Paternalism, Conflict and Co-production: Learning From Citizen Action and Citizen Participation in Western Europe.
New York: Plenum Press

Wates, N (1987) Community Architecture: How People are Creating their Own Environment.
Penguin

Wharwick, D (1975) The Sample Survey: Theory and Practice
McGraw- hill, Inc

Whitelegg, J (1993) Transport for a Sustainable Future
Belhaven Press London and New York.

Whittick, A (1974) Encyclopaedia of Urban Planning
McGraw- hill, Inc

William E, R (1991) *Sustainable Communities: planning for the 21th Century.*
Plan Canada, p 15.

Youngson, A.J(1966) The Making of Classical Edinburgh 1750-1840
Edinburgh University Press.

Dissertations

Abdallah, M. (1998) Environmental Knowledge and City Perception: A Focus on the Energy Link to Environmental Aesthetics. Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished PhD. Dissertation).

Assi, E.S (1998) Interpretation of the Built Environment: User Approach with Reference to Nablus as a Case Study. Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished PhD. Dissertation).

Bell, D.J (1994) A Review of Georgian Edinburgh, 1746-1793 PhD dissertation Edinburgh College of Art

Kaki, A.W (2000) The Structural Approach to City Image (Al-Madinah Al- Munawara). Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished PhD. Dissertation).

Kitoni, S (1988) Cognition and Environmental Design Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished Msc thesis in Urban Design).

Mc Master, R (1993) Quality of Life in the Urban Metropolis, is the Compact City a Solution to Urban Sprawl Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished Dip TP. Dissertation).

Masaud, M.A. (1997) Adaptation and Motivation: An Environmental Model for Architectural Meaning. Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished PhD. Dissertation).

Nabih, H.E (1999) Place Evaluation: A Transactional Adaptive Approach, The Case Study of Cairo's Waterfront Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished PhD. Dissertation).

Nabih, W.E (1999) System, Control and Sustainability: A Concept of Control in the Local Environment System Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished PhD. Dissertation).

Nasser, B Holistic Reading into the Structure of the Environment: Case Study of Tehran. Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished PhD. Dissertation).

Ujam, F.A (1987) Ecology, Culture and Cognition Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished PhD. Dissertation).

Whitworth, F (1992) An analysis of the character of identity: (with reference to Lower Largo, Fife). Scotland: Edinburgh College of Art, Heriot-Watt University (Unpublished March Dissertation).

Web sites

Gaia Ecovillage www.gaia.org

Ottawa tourism and Convention Authority (OTCA) www.tourottawa.org

Regional municipality of Ottawa-Carleton (RMOC) www.rmoc.on.ca

UNHCS: Habitat Agenda www.unhabitat.org

Organisations

OECD (1978) Energy Problems and Urban and Suburban Transport.
OECD

OECD (1985) Energy Saving and Road Traffic Management.
OECD

OECD (1990) Organisation for Economic Development Environmental Politics for cities in the 1990's.
Paris 1990.

WCED (1987) World Commission on Environment and Development: Our Common Future
Oxford University Press.

Appendix

APPENDIX 1

THE QUESTIONNAIRE

SECTION A: GENERAL

1- Living area: Please write.....
2- Sex..... Male..... Female
3- Marital status: ..... Married..... .. Single
4- Age of interviewee. Under20..... 20-30..... 31-40
41-50..... Over50
5- Occupation of interviewee
Self employed .... Full Time Work..... Part Time Work.....
Retired.....…. Others(specify). .....

SECTION B: YOUR HOME

1- Is your home Owned..... Rented..... Others, can you specify ..
2- Why do you choose to live here?
Because of work..... Your family has always lived here.
You like the place(physical appearance)..... Good in price
Others(specify). .....
3- Housing type:
Tenement flat Semi-detached house
Other flat Detached house
5- How long have you lived at your present address?
(please write in figures)_ _____/Years _ _____/Months
6- Are you planning to move home? YES NO
Can you specify why? .....

SECTION C: HOME QUALITY

1- How satisfied or dissatisfied do you feel about your home? please circle
(Neither satisfied or dissatisfied)

Very satisfied	Fairly satisfied	NSD	F Dissatisfied	Very Dissatisfied	Don't know
1	2	3	4	5	6

2- Here some satisfaction measures of housing quality. Please rate your house on the following. please circle(from 1 very satisfied to 5 very dissatisfied, 6 don't know)
(Neither satisfied or dissatisfied)

	Very satisfied	Fairly satisfied	NSD	F Dissatisfied	Very Dissatisfied	Don't know
House location.	1	2	3	4	5	6
Overall appearance	1	2	3	4	5	6
Building material	1	2	3	4	5	6

SECTION D: NEIGHBOURHOOD

1- How long have you lived in the neighbourhood? \ _____ / (Year)
2- Numbers of friends in community? \ _____/
3- Numbers of relatives in the community? \ _____/
4- In general, what do you think of this particular neighbourhood as a place to live? please circle

(Neither good nor bad)
Very good place Fairly good place NSD not a very good place not at all a good place Don't know
1.....2.....3.....4.....5.....6

5- How do you rate the following please circle

(Neither satisfied or dissatisfied)
Very satisfied Fairly satisfied NSD F Dissatisfied Very Dissatisfied Don't know

Street life
1.....2.....3.....4.....5.....6
Variety of facilities
1.....2.....3.....4.....5.....6
Social interaction
1.....2.....3.....4.....5.....6

6- How would you describe the relationship with your neighbours? Please mark
Look unfamiliar Look familiar know by name

Visit and talk Say hello Borrow things
7-How far do you know your neighbours? please mark
None Only next door neighbours Only this building
The street The whole neighbourhood
8- Is there a good relationship between the individuals of the neighbourhood?
Very bad Bad Average Good Very good
1.....2.....3.....4.....5.
9- If you had the choice to re-select your residential area, which of the following conditions would be of the greatest priority in your consideration? Please write by order from 1 to 8.
.... Close to the city centre .... Close to the good school .... Close to countryside
.... Close to the work place .... Better neighbours .... Close to friends/ relatives
.... Close to parks .... Proximity to public transport

Other(specify) .....Why?.....

10- Taking into consideration all the criteria on the neighbourhood how satisfied are you. please circle

(Neither satisfied or dissatisfied)
Very satisfied Fairly satisfied NSD Fairly Dissatisfied Very Dissatisfied Don't know
1.....2.....3.....4.....5.....6

SECTION A

1- How many car do you own? None..... . 1..... 2..... 3. more
2- Which of the following do you normally use to go to work? please tick
Walk..... Bike..... Bus..... Car.....
Others.....
3-Does the weather influences you to use the type of transport to go to work?.
Yes No Don't know
4- Does your job influences you to use the type of transport Yes No Don't know
5- How much time do you spend in commuting ? (hour)_ _____/ Per day
6- How many miles do you usually do in commuting? _ _____/ Per day
7- Taking your situation towards sustainability are you influenced by the media?
Yes No Don't know
If Yes can you please specify how?.....
8- Are you satisfied with transport as a sustainable user? Please circle
(Neither satisfied or dissatisfied)
Very satisfied Fairly satisfied NSD Fairly Dissatisfied Very Dissatisfied Don't know
1.....2.....3.....4.....5.....6

9- Do you actively implement sustainability at home. Yes No
Don't know
If Yes please specify how?.....
10 -Taking into consideration energy use on transport how satisfied are you? please rate

(Neither satisfied or dissatisfied)
Very satisfied Fairly satisfied NSD F Dissatisfied Very Dissatisfied Don't know
1.....2.....3.....4.....5.....6
11- Do you actively implement sustainability on transport? Yes No
Don't know
If Yes please specify how?.....

SECTION B

1- How satisfied or dissatisfied do you feel about variety of facilities in your neighbourhood? please circle
(Neither satisfied or dissatisfied)
Very satisfied Fairly satisfied NSD Fairly Dissatisfied Very Dissatisfied Don't know
1.....2.....3.....4.....5.....6
2- Can you get your basic needs close by ? please write by order from 1 to 5
... I can get all my needs close by..... .... I can get most of my needs close by.....
... I can get some needs close by..... ... I get most of my needs from far away .....
I get all my needs from far away ... Others please (specify).....
3- Where do you usually get your basic needs, and how often ?.

SECTION C

1- Where do you work in relation to where you live? please tick

Work and live in the same neighbourhood Work near within distance of my home

I work far from my home I take a short ride

I take several rides

2- How satisfied or dissatisfied do you feel about the location of your place of work? please circle

(Neither satisfied or dissatisfied)

Very satisfied Fairly satisfied NSD Fairly Dissatisfied Very Dissatisfied Don't know

1.....2.....3.....4.....5.....6

3- If you had the choice to re-select your work place, which of the following conditions would be of the greatest priority in your consideration? Give two reason why? by order from 1 to5

Close to the city centre Close to living place Close to parks

Close to countryside Proximity to public transport

Other (specify) .....

4- How satisfied are you with your salary.? please circle

(Neither satisfied or dissatisfied)

Very satisfied Fairly satisfied NSD F Dissatisfied Very Dissatisfied Don't know

1.....2.....3.....4.....5.....6

5- How satisfied are you with your type of job? please circle

(Neither satisfied or dissatisfied)

Very satisfied Fairly satisfied NSD F Dissatisfied Very Dissatisfied Don't know

1.....2.....3.....4.....5.....6

THANK YOU FOR YOUR CO-OPERATION

THE OPEN-ENDED QUESTIONNAIRE

Question 1:

Mention two things which you like in your house?

1-.....

2-.....

Question 2:

Mention two things you do not like in your house?

1-.....

2-.....

Question 3:

Can you mention what you like in your neighbourhood as a place to live?

.....

Question 4:

What do you dislike about your neighbourhood as a place to live?

.....

Question 5:

Identify two things you wish to change about your neighbourhood?

1-.....

2-.....

Question 6:

What do you like about your place of work?

1-.....

2-.....

Question 7:

What do you dislike about your place of work?

1-.....

2-.....

APPENDIX 2

Downtown Map of Ottawa
Key Sites and Points of Interest

Points of Interest

1. Parliament Hill
2. Supreme Court of Canada
3. National Archives &National Library of Canada
4. Currency Museum
5. National Arts Centre
6. National War Memorial
7. Museum of Contemporary Photography
8. Government Conference Centre
9. Ottawa Congress Centre
10. Peacekeeping Monument
11. Canadian Museum of Caricature
12. National Gallery of Canada
13. Canadian War Museum
14. Royal Canadian Mint
15. Canadian Museum of Civilization
16. Maison du citoyen
17. Palais des congrès de Hull
18. Canadian Museum of Nature

Figure 1 Satellite picture of Downtown Ottawa

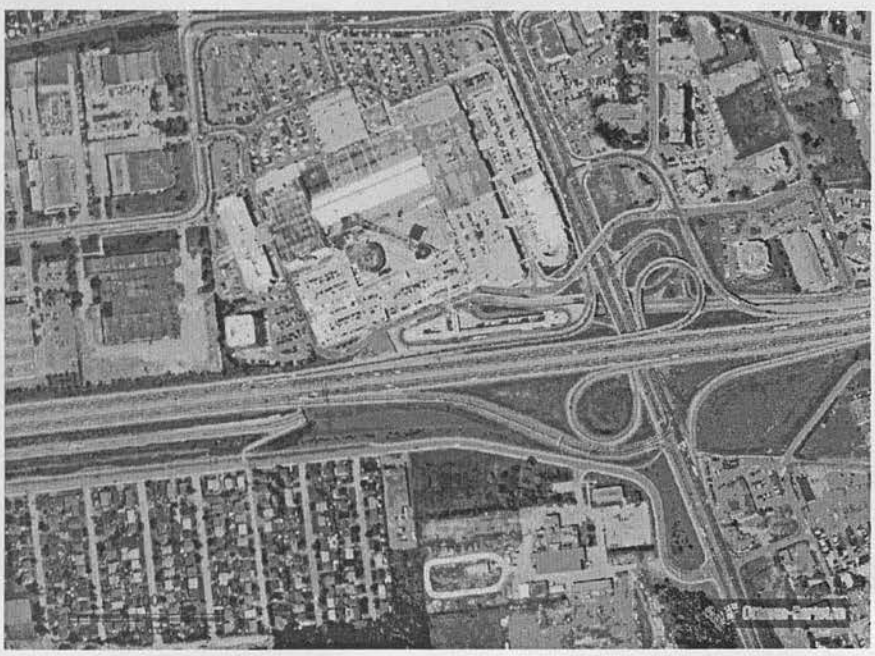


Figure 2 Sprawl: A mall in Ottawa

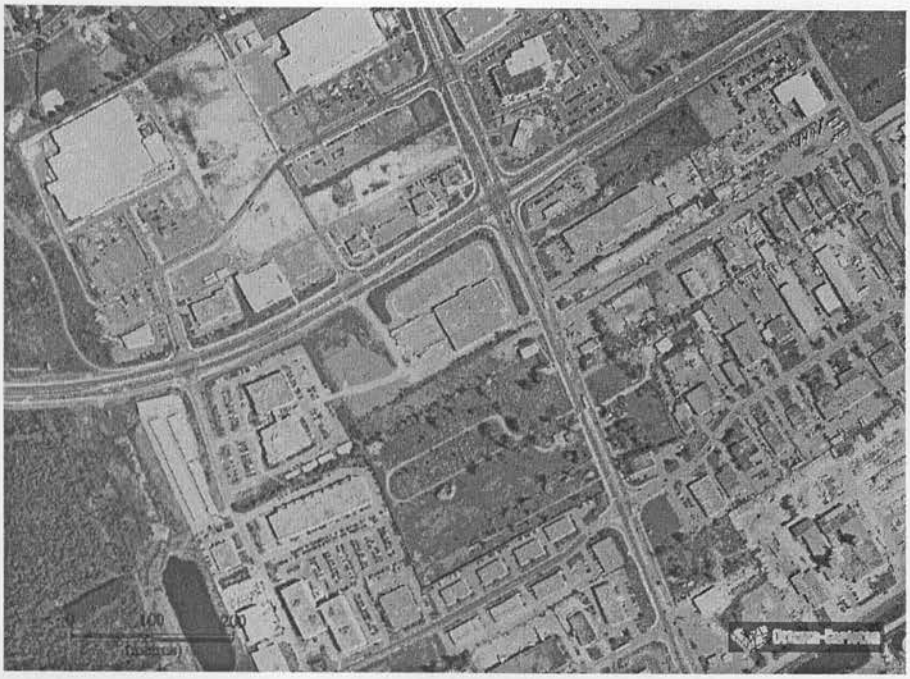


Figure 3 High tech firms in the outskirts of Ottawa

Figure 4 Suburban sprawl in Ottawa

Figure 5 Edinburgh's old town

Figure 6 Car traffic in Edinburgh

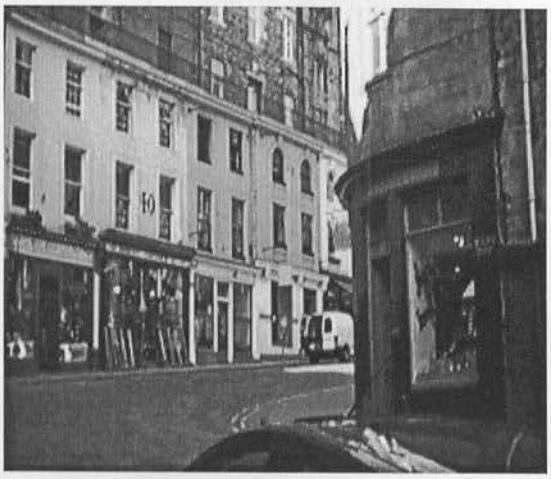


Figure 8 Victoria street in Edinburgh

Figure 9 Bank street in Ottawa

Figure 10 Victoria street Edinburgh

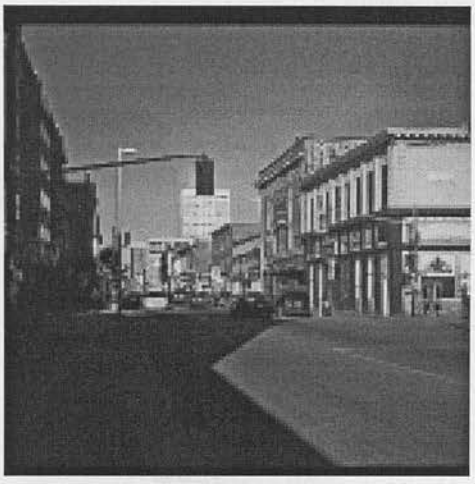


Figure 11 Bank street in Ottawa

Figure 8 Old buildings in Edinburgh

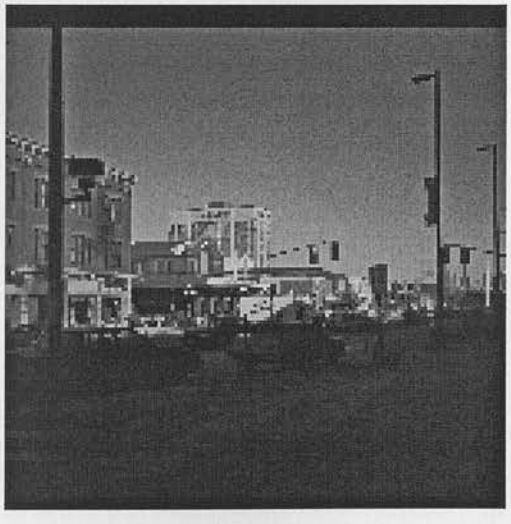


Figure 9 Bank street in Ottawa